PROSPECTIVE STUDY ON THE SONOGRAPHIC EVALUATION OF UMBILICAL CORD COILING INDEX IN LATE SECOND TRIMESTER AND ITS ASSOCIATION WITH PERINATAL OUTCOME

Dissertation submitted in partial fulfillment of requirements for

M.D. DEGREE BRANCH II

OBSTETRICS ANDGYNAECOLOGY
MADRAS MEDICAL COLLEGE
CHENNAI

THE TAMILNADUDR.M.G.R.MEDICAL UNIVERSITY
CHENNAI

APRIL 2013

CERTIFICATE

This is to certify that the dissertation entitled "**PROSPECTIVE STUDY ON THE SONOGRAPHIC EVALUATION OF UMBILICAL CORD COILING INDEX IN LATE SECOND TRIMESTER AND ITS ASSOCIATION WITH PERINATAL OUTCOME"** is a bonafide work done by **Dr.N.GAYATHRI** in the Institute of Obstetrics and Gynaecology (MadrasMedical College) Egmore, Chennai in partial fulfillment of the university rules and regulations for award of MD degree in Obstetrics and Gynaecology under my guidance and supervision during the academic year2009-2012.

Prof.DR.V.KANAGASABAIM.D

DEAN
Madras Medical College &
Rajiv Gandhi Govt.General Hospital
Chennai–3

Prof. DR.P.MEENALOCHANIM.D., DGO.

Director and Superintendent
Institute of Obstetrics &Gynaecology
Madras medical college, Chennai-3

Prof. DR.P.MEENALOCHANI M.D., DGO.
Guie
Institute of Obstetrics and Gynecology
Madras Medical College, Chennai-3.

DECLARATION

I solemnly declare that this dissertation entitled **"PROSPECTIVE STUDYON SONOGRAPHIC EVALUATION OF UMBILICAL CORD COILING INDEX IN LATE SECOND TRIMESTER AND ITS ASSOCIATION WITH PERINATAL OUTCOME"** was done by me at Institute of Obsterics &Gynaecology, Madras Medical College during 2010-2013 under the guidance and supervision of**Prof.Dr.P.MEENALOCHANI MD.,DGO.** This dissertation is submitted to the Tamil Nadu Dr.M.G.R. Medical University towards the partial fulfilment of requirements for the award of M.D.Degree in Obstetrics and Gynaecology (Branch-II).

Place:Chennai

Date:

Signatureof Candidate

Dr.N.GAYATHRI M.B.B.S
MD Post Graduate Student
Institute of Obstetrics &Gynaecology,
Egmore, Chennai

Prof. DR.P.MEENALOCHANI M.D., DGO
Guide
Institute of Obstetrics and Gynaecology,
Madras Medical College,Chennai-3.

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI -3

Telephone No: 04425305301
Fax : 04425363970

CERTIFICATE OF APPROVAL

To

Dr. N. Gayathri
PG in MD Obstetrics & Gynaecology
Madras Medical College, Chennai -3

Dear Dr. N. Gayathri

The Institutional Ethics Committee of Madras Medical College reviewed and discussed your application for approval of the proposal entitled " A prospective study on sonographic evaluation of umbilical coiling index in late second trimester and its association with perinatal outcome at Institute of Obstetrics and Gynaecology, Chennai " No. 10062012.

The following members of Ethics Committee were present in the meeting held on 27.06.2012 conducted at Madras Medical College, Chennai -3.

1.	Prof. S.K. Rajan, MD, FRCP, DSc.	-- Chairperson
2.	Prof. Pregna B. Dolia MD Vice Principal / Director , Instt. of Biochemistry , M M C, Ch-3	-- Member Secretary
3.	Prof K.M. Sudha MD Prof . of Pharmacology, MMC, Ch-3	-- Member
4.	Prof. C. Rajendiran, MD Director , Institute of Internal Medicine, MMC, Ch-3	-- Member
5.	Prof. Karkuzhali MD Director i/c, Prof of Pathology, MMC, Chennai -3	-- Member
6.	Thiru. S. Govindasamy . BA.BL	-- Lawyer

We approve the proposal to be conducted in its presented form

Sd /. Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, any SAE occurring in the course of the study, any changes in the protocol and patient information / informed consent and asks to be provided a copy of the final report

Member Secretary, Ethics Committee

ACKNOWLEDGEMENT

I gratefully acknowledge and sincerely thank the **Prof.Dr.V.KANAGASABAI,MD, DEAN** Madras Medical College and Rajiv Gandhi Govt.General Hospital, Chennai-600003 for permitting me to conduct the study and use the facilities of the Institution for my study.

Iam grateful to the Director and superintendent, **Prof. Dr.P.MEENALOCHANI MD.,DGO,** Institute of Obstetrics &Gynecology, Egmore, Chennai for being my guide and helping me all through the study.

My sincere thanks to **Prof.vDr. JAYASHREE SRINIVASAN MD., DGO**, former professor Institute of Obstetrics &Gynecology, Egmore, Chennai, for their valuable help and guidance.

I also express my gratitude to **Dr.N.K.MANI D.A., & Dr.S.NIRUPA MD., DGO, RMO AND ARMO** of Institute of Obstetrics &Gynaecology, for their constant support.

I also thank **Dr.KALPANA DMRD M.D.,** for her support all through the study.

My sincere thanks to **Dr. RAVANAN** PH.D., for his immense help in statistical analysis of the data and results.

I wish to express my sincere thanks to all the other Unit Chiefs and Assistant Professors of our Department for their support during this study.

TABLE OF CONTENTS

INTRODUCTION

The umbilical cord is the major feto maternal unit that provides communication between the placenta and fetus. It is the life line of the fetus as it supplies water, nutrients and oxygen. It is vital to the development, well-being and survival of the fetus. It has 3 blood vessels that pass along the length of the umbilical cord in a coiled fashion. The umbilical cord is protected by Wharton's jelly, amniotic fluid, helical pattern & coiling of vessels.

The coiling property of cord vessels was described as early as 1521 by Berengariusand confirmed by Columbus in 1559 and by Frantius in 1564. Of the many characteristics of the human umbilical cord, the most mysterious and intriguing one is the twisted or spiral course of its component blood vessels. In 1600, Fabricius demonstrated that both right (dextral) and left (sinistral) helices of the umbilical cord exists. If umbilical cord twists were to be randomly determined both twists will be of equal incidence. However, many investigators have found that the majority of the cords have a left-sided twist.[4,14,16]

The umbilical coiling was first quantified by Edmonds in 1954 who divided the total numbers of coils in the umbilical cord by the length of the cord in centimeters and called it "The Index of twist". He assigned

positive and negative scores to clockwise and anticlockwise coiling respectively. Strong et al later simplified by eliminating the directional scores and named it “The Umbilical CoilingIndex.”[1]

Coiling and its effect on the fetus:

The coiling of the umbilical vessels develops as early as 6 weeks after conception and is present in about 95% of fetuses by 9 weeks of conception[4] .The number of twists seen in the first trimester is roughly the same as that seen in term cords. Umbilical coiling confers turgor to the umbilical unit, producing a cord that is strong yet flexible. Since lengthening of the cord occurs from the fetal end, perhaps coiling of the cord represents a long-term record of fetal well-being[16].

The umbilical cord coiling level can be objectively presented by the umbilical coiling index (UCI). It is possible to measure the umbilical coiling index antenatally using ultrasonogram.

Coiling level is associated by adverse prenatal outcomes such as intrauterine fetal death, intra uterine growth restriction and fetal distress duringlabour.Hence if the coiling index was measured antenatally, it would act as a marker of adverse perinatal outcome and the obstetricians and paediatricians would be prepared to handle the situation.

Hence this study was conducted to determine whether the umbilical coiling index as assessed sonographicallyin the late second trimester was associated with adverse perinatal outcomes .

REVIEW OF LITERATURE

The umbilical cord is also called the “FuniculusUmbilicalis”. It acts as a connecting link between the fetus and the placenta and helps in transfer of oxygen and nutrients to the fetus.

The umbilical cord usually consists of two arteries and 1 vein. It is surrounded by the gelatinous material called the Whartons’s jelly.

The placenta and the embryo are connected by the connecting stalk by the end of the third week of intra uterine life. The primitive umbilical ring and the vitello intestinal duct are formed by the end of the fifth week.

The length of the umbilical cord at term is about 50 cm and the diameter is about 2 cm.

Embryology:

During the early stage of development, the embryo in the form of a three layered disc. They are:

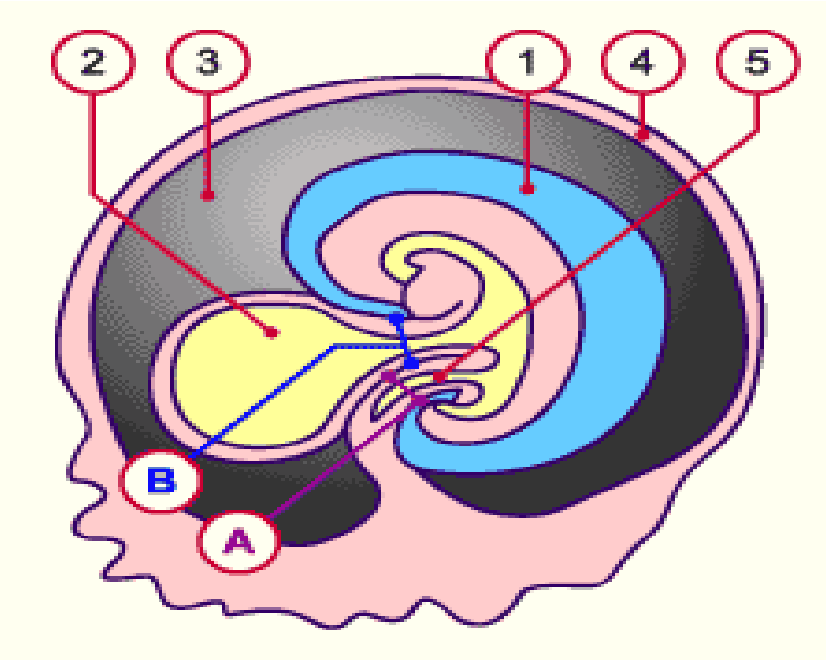
1. Endoderm
2. Ectoderm
3. Mesoderm

The endoderm is the first germ layer to be formed, followed by the ectoderm. After the formation of this two layered structure a space appears

between the ectoderm and trophoblast. This forms the amniotic cavity and is filled by amniotic fluid.

The cells of the endoderm line the inside of the blastocystic cavity and this cavity forms the primary yolk sac[17].

Formation of the connecting stalk:



1. **Amniotic cavity**
2. **Yolk sac**
3. **Extra embryonic coelom**
4. **Chorion**
5. **Allantois**

The mass of cells which are formed from the trophoblast come to lie between the trophoblast and the endodermal cells lining the yolk sac. These cells also separate the amniotic cavity from the trophoblast.

This mass of cells is called the extra embryonic mesoderm and as the name suggests it does not give rise to any tissues of the embryo itself.

Cavities appear in the extra embryonic mesoderm which later coalesce to form the extra embryonic coelom, also called the chronic cavity. This extra embryonic coelom is not present in that part of the extra embryonic mesoderm which attaches the wall of the amniotic cavity to the trophoblast.

The developing embryo is now suspended in the extra embryonic coelom and is attached to the wall of the trophoblast only by thisunsplit part of the extra embryonic mesoderm. This mesoderm forms a structure called the connecting stalk[17].

Formation of amnion,chorion and secondary yolk sac

Two very important membranes are formed during the development of the embryo.

They are:

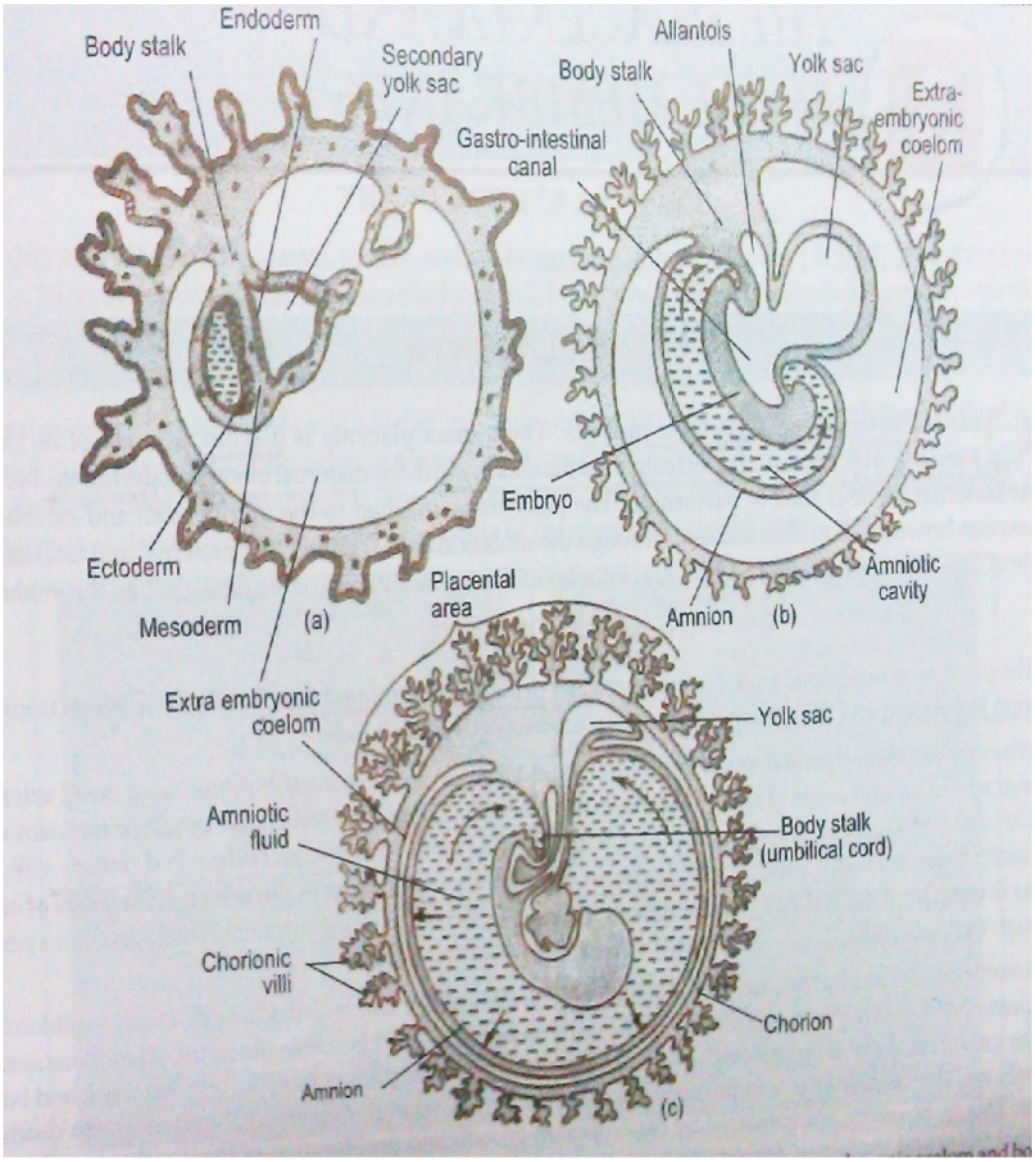
1. Amnion
2. Chorion

Chorion is formed by the parietal layer of extra embryonic mesoderm on the inside and by the overlaying trophoblast outside. Amnion is constituted by the amniogenic cells which are formed from the trophoblast and line the amniotic cavity except the floor.

With the appearance of the extra embryonic coelom, the yolk sac becomes much smaller and is called the secondary yolk sac.

Folding of the embryo:

With the progressive increase in size of the embryo, the embryonic disc becomes folded on itself at the head and tail ends. These are called the head and tail folds[(17).]



Formation of umbilical vesicle and vitellointestinal duct:

With the formation of these folds the yolks sac becomes enclosed within the embryo. A tube lined by endoderm is formed which is called the primitive gut. Initially this gut is in wide communication with the yolk sac. Later this communication becomes progressively narrower. As a result the yolk sac

becomes small and inconspicuous and is now called the definitive yolk sac. This is also called the umbilical vesicle[17].

The narrow channel connecting the definite yolk sac to the gut is called the vitello-intestinal duct. It is otherwise known asvitelline duct, yolk stalk or omphalomesentric duct. This duct becomes elongated and eventually disappears.

Importance of connecting stalk:

It is obvious that the only connecting link between the embryo and the placenta is the connecting stalk.

As the embryo grows, the area of attachment of the connecting stalk becomes relatively smaller. Gradually this attachment is seen only at the caudal end of the embryonic disc.

With the formation of the tail fold, the attachment of the connecting stalk comes to the ventral aspect of the embryo. It is now attached in the region of the umbilical opening.

Formation of umbilical cord:

Once the blood vessels are formed in the embryo and placenta, they communicate with each other by means of arteries and veins passing through

the connecting stalk. At first there are 2 arteries and 2 veins in the connecting stalk. Later the right vein disappears[17].

The amnion has a circular attachment to the margins of the umbilical opening, and forms a wide tube in which the following lie:

1. Vitello intestinal duct and remnants of yolk sac.
2. Extra embryonic mesoderm of the connecting stalk. This mesoderm is converted into a gelatinoussubstance called the whartons jelly. This protects the umbilical cord and is rich in proteoglycans.
3. Blood vessels that pass from the embryo to the placenta.
4. A small part of extra embryonic coelom.

This tube of amnion and structures within it constitute the umbilical cord. The length of the umbilical cord progressively increases with gestational age.

Characteristic of the umbilical cord

- The usual length is about 50 cm at term and varies between 30-100 cm.
- The average diameter is about 2 cm and varies between 1 cm to 2.5 cm.
- It is moist, dull white in colour and covered by amnion.
- The thickness is not uniform and consists of nodes or swellings at places. These are called the false knots and may be due to local collection of Wharton's jelly or dilatation of umbilical veins.
- The right umbilical vein disappears by 4^{th} monthof intra uterine life. Presence of single umbilical artery is often associated with fetal congenital abnormalities.
- The umbilical arteries do not posses internal elastic lamina.
- The umbilical vein has a well developed internal elastic lamina
- The media of the umbilical vessels does not have true circular or longitudinal muscle fibres, instead there are decussating helicoidal smooth muscle bundles.
- There are furrows on the outer surface of the umbilical arteries which corresponds to the inner folds of Hoboken which alternates with dilated nodes of Hoboken.

- These structures occlude the lumen during spasm and provide intrinsic capacity to control bleeding in unassisted labour.
- Both the umbilical arteries and umbilical veins do not posses vasa vasorum.
- But the intra abdominal portions of the umbilical arteries have vasa vasorum beyond 20 weeks of gestation.
- The nutritional requirements of the umbilical cord are met by transmural diffusion mainly across the thin walled veins.
- The umbilical cord is usually attached to the placenta near the centre.
- The vascular tone is modulated by local prostaglandin production and this is influenced by maternal smoking and pre eclampsia.
- The placenta has no nerves. No nerves traverse the umbilical cord.

Fetal circulation

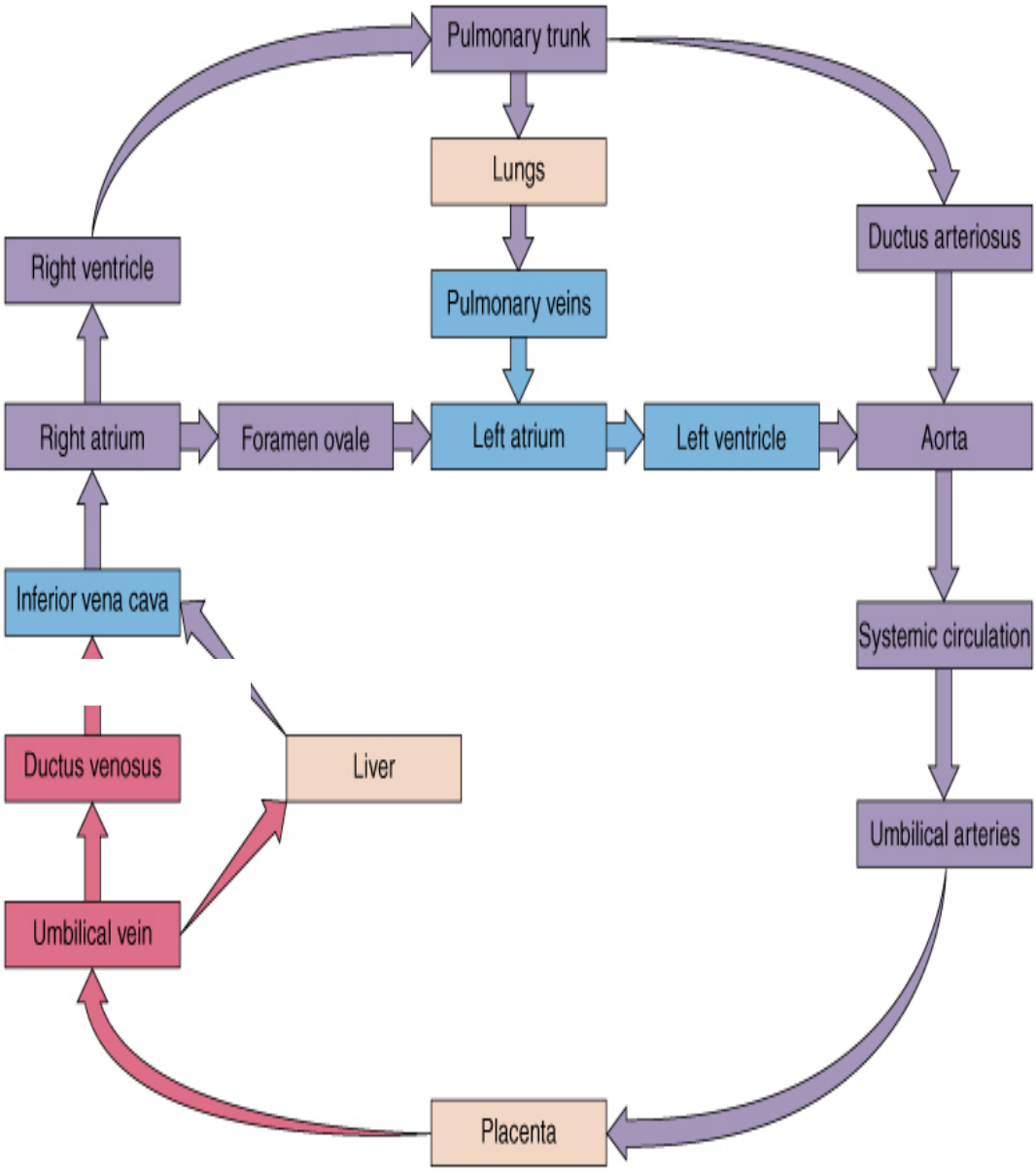
- The umbilical vein carrying the oxygenated blood from the placenta enters the fetus at the umbilicus and runs in the free margin of the falciform ligament of the liver.
- In the liver, it gives off branches to the liver and receives deoxygenated blood from the portal vein. The greater part of the oxygenated blood short circuits the liver through the ductusvenosus to enter the inferior vena cava and hence the right heart.
- In the right heart, 75% of the blood is guided towards the foramen ovale by the valve of inferior vena cava and hence reaches the left atrium. Here it is mixed with small amount of venous blood returning from the lungs through the pulmonary veins. This left atrial blood enters the left ventricle through the mitral opening.
- Remaining 25%of blood, after reaching the right atrium via superior and inferior vena cava passes through the tricuspid opening into the right ventricle.
- During the ventricular systole, the left ventricular blood is pumped into the ascending aorta and arch of aorta and distributed by their branches to the heart, head, neck, brain and arms. The right ventricular blood with low oxygen content is discharged into the pulmonary trunk. Since the resistance in the pulmonary artery is

very high during fetal life, the major portion of blood passes directly through the ductusarteriosus into the descending aorta bypassing the lungs.

- This mixed blood is distributed via the descending aorta . The deoxygenated blood leaves the fetus by way of the two umbilical arteries to reach the placenta where it gets oxygenated.

Changes in the fetal circulation after birth:

1. Closuse of the umbilical arteries: Functional closure is almost instantaneous. Actual obliteration takes about 2-3 months. The distal parts form the lateral umbilical ligaments and the proximal part remains open as superior vesical arteries.
2. Closure of umbilical vein: The obliteration occurs a little later than the arteries. After obliteration, the umbilical vein forms the ligamentumteres and ductusvenosus forms the ligamentumvenosum.
3. Closure of ductusarteriosus: Functional closure of the ductus occurs soon after the establishment of pulmonary circulation. Anatomical obliteration takes about 1-3 months and becomes the ligamentumarteriosum.
4. Closure of foramen ovale: Functional closure occurs soon after birth but anatomical closure occurs in about a year.



(c) Scheme of fetal circulation

Abnormalities of the umbilical cord:

Short cord:

- In true short cords, the length of the cord is less than 20 cm.
- There can be relative shortening of the cord due to entanglement of the cord around any fetal part.
- Sometimes the umbilical cord may be absent and the placenta may be attached to the liver as in exomphalos.
- This can lead to delay in descent of fetus during labour, intra partum hemorrhage due to premature separation of placenta or inversion of uterus.

Long cord:

- This is when the cord is unusually long (more than 70 cm at term).
- This can give rise to cord presentation and cord prolapse , true knots of the cord and nuchal cord.
- According to the stretch hypothesis, fetuses with long cord are hyperkinetic when compared with those of shorter cords.

Single umbilical artery:

- Single umbilical artery is present in about 0.85% of all singleton pregnancies.
- About 30% of these infants have associated congenital abnormalities.
- 34% of these fetuses were growth restricted.
- 17% delivered preterm.
- Single umbilical artery was usually associated with maternal diabetes, epilepsy & pre eclampsia.

Supernumerary umbilical vessels:

- Less common than single umbilical artery.
- The additional vessel could be an artery, vein – persistent right umbilical vein or capillary(persistent vitelline vessels).
- Pseudo supernumerary vessels is seen in heavy maternal smoking.

Insertion of the cord:

- The cord is normally inserted close to the centre of the placenta.
- Central and eccentric insertion account for 90%

- Rest of the 10% may be marginal insertion or velamentous insertion.

Velamentous insertion:

- In velamentous insertion, the umbilical vessels instead of inserting into the placental mass, traverses through the fetal membranes before inserting into the placenta.
- Here the umbilical cord inserts on the chorioamniotic membranes rather than the placental mass.
- In occurs in 1.1% of singleton pregnancies and 8.7% of twin gestations.

Marginal insertion:

- This is also called the battledore placenta.
- The umbilical cord is inserted into the margin of the placenta.

Knots:

- These can be either true knots or false knots.
- False knots result from linking of vessels to accommodate the length of cord or due to local accumulation of Wharton's jelly.
- True knots result when the fetus passes through a loop of the cord. This usually occurs with long cords.

- True knots can constrict the blood vessels and lead to fetal demise.

Hematoma of the cord:

- This usually results from rupture of varix of the umbilical vein and effusion of blood into the cord.

Stricture of cord:

- This occurs due to an extreme local deficiency of the Wharton's jelly with or without vascular occlusion.
- More common near the fetal end of the cord.
- Most infants with this kind of stricture are still born.
- Criteria to suggest stricture as the cause of fetal demise includes venous congestion and edema distal to torsion and /or intra vascular antepartum thrombi.

Remnants:

- Proximal part of the vitello intestinal duct may persist to form the Meckel's diverticulum.
- Sometimes the entire vitello intestinal duct may persist giving rise to a cyst or sinus.
- Remnant of the yolk sac may be seen as a small yellow body near the attachment of the cord to the placenta.

- Allantois is a blind tubular structure that may be occasionally present near the fetal end which is continuous with the fetal bladder and urachus.
- In the early period, intra embryonic coelom is continuous inside with the extra embryonic coelom along with herniation of coils of intestine. This condition may persist as congenital umbilical hernia or exomphalos.

Twisting of the cord

A 360°turn of the umbilical vessels is called a coil.Berengarius in 1521, first described the coiling of umbilical cord.

Twisting or coiling of the cord can be seen as early as 6 weeks of intra uterine life and is well established by 9th week[4].The twisting can be in two ways:

1. Clockwise or right sided twisting
2. Anti clockwise or left sided twisting

Clockwise or anti clockwise twisting of the cord occurs at random.

However some authors have reported left sided twisting or anti clockwise twisting to be more common than the clockwise twisting. About 85% were found to be twisted in the anti clockwise direction and 15% in the clockwise direction. (7:1 ratio).

It was suggested that handedness could be a factor that determines the direction of coiling of the umbilical cord. This is because the ratio of right and left handed people in the world is roughly 7:1 which is the same as the anti clockwise and clockwise coiling of the umbilical cord[18].

Simpson held that rotational torque resulting from differential blood flow between the left and right umbilical arteries could produce the twist in the umbilical cord.

The fact that right umbilical artery is usually larger than the left umbilical artery would explain why left sided twisting is more common than the right twist.

According to the Bathtub Vortex theory,"Fetus in utero rotates in the counter clockwise direction in the northern hemisphere and in the clockwise direction in the northern hemisphere similar to the direction of rotation of hurricanes or water drainage out of the bath tub".

Edmond's hypothesis states that the twist of the umbilical cord is a result of the rotatory movement imparted to the embryo and hence umbilical cord coiling index is more in polyhydramnios and less in oligohydramnios.

Causes for twisting of the cord:

The factors leading to coiling of the cord are unknown. Various hypothesis have been put forward by various authors. They include:

- Early fetal activity
- Differential growth of the umbilical cord vasculature
- Hemodynamic factors (there is increased coiling in the recipient of twin to twin transfusion syndrome).

- Presence of Roach muscle fibres in the umbilical arterial wall
- Active or passive torsion of the embryo.

Umbilical coiling index

The number of twist seen in the umbilical cord in the first trimester is roughly the same as that seen at term. The total number of coils in the umbilical cord ranges anywhere between 0 and 40.

The coiling of the cord confers protection to its vasculature and prevents kinking. The umbilical cord coiling index (UCI) is calculated using the formula:

$$UCI = \frac{Number\ of\ coils\ in\ the\ umbilical\ cord}{Total\ length\ of\ the\ cord}$$

The number of coils gets fixed by about the first trimester. Whereas the length of the cord increases with gestation age. This indicates that the umbilical coiling index decreases as the gestational age increases.

The length of the umbilical cord increases by about 3-6 cm every month and this is more marked in the latter half of the pregnancy. Thus the coiling index in the third trimester is less than that seen in the second trimester. Moreover the lengthening of the cord takes place at different rates in different fetuses and hence the change in umbilical cord coiling index varies from

individual to individual. The number of coils is more towards the fetal end of the cord than the placental end or the middle segment.

It is not possible to measure the length of the umbilical cord prior to birth. Hence a method was deviced to measure the coiling index antenatally using ultrasonogram. This is done by calculating the distance between two adjacent coils and umbilical coiling index is calculated using the formula:

$$UCI = \frac{1}{Distance\ between\ the\ two\ adjacent\ coils\ in(cm)}$$

The umbilical cord coiling index is classified as hypocoiled, hypercoiled and normocoiled.

Hypocoiled< 10^{th} percentile

Hypercoiled> 90^{th} percentile

There are not much studies to show the association of antenatal sonographic umbilical cord coiling index and its association with adverse perinatal outcome. Studies conducted in the early second trimester (ie) between 14-16 weeks have shown hypocoiling to be associated with intra uterine growth restriction of the fetus. But no association was found between hypocoiling and preterm birth, low APGAR scores or abnormal fetal heart rate patterns.

Similarly studies conducted in the mid second trimester (ie) 18-23 weeks show that both hypocoiling and hypercoiling were associated with intra uterine growth restriction & abnormal fetal heart patterns during labour. But no association was found between coiling index and meconium staining of liquor, preterm birth, mode of delivery or low APGAR scores.

Studies conducted during the late second trimester (ie) 22-28 weeks have shown that hypocoiling is associated with intra uterine growth restriction, preterm birth, which in turn leads to low birth weight babies, low APGAR scores and increased rate of admission to neonatal intensive care unit.

Abnormal umbilical coiling leads to impaired growth of the fetus and results in adverse perinatal outcomes. Umbilical coiling index was found to be related to the Doppler flow characteristics in the umbilical vein. There was a difference in the antepartum coiling index in case of discordant twins which correlated well with the discordance in their weights and Doppler flow parameters.

According to Manal M," Thinner or leaner umbilical cord was found to be significantly associated with hypocoiling, cord cross sectional area, amount of Wharton's jelly and venous blood flow."

As said by Geoffrey A .Machin," Abnormal cord coiling was associated with thrombosis of the chorionic plate vessels, umbilical venous thrombosis and cord stenosis. Thus abnormal cord coiling is a chronic state, established in early gestation,that may have chronic(growth retardation) and acute (fetal intolerance to labour and fetal demise) effects on the fetal well being."[7]

Studies on umbilical cord coiling index:

A study was done on antenatal coiling index calculated during the late second trimester at the Catholic University of Korea, Seoul. A total of 226 women were included in the study. The average gestational age at which the umbilical coiling index was measured was 24.7weeks. This study showed a 36.4% incidence of preterm delivery in the hypocoiled group in comparison to 16.7% in the hypercoiled group and 7.7% in the normocoiled group. There was a 36.4% incidence of low birth weight babies in the hypocoiled group in comparison to 20% in the hypercoiled group and 10% in the normocoiled group. The rate of caesarean section was not different among the various groups. There was a 27.3% admission rate to neonatal intensive care unit in the hypocoiled group in comparison with 6.8% in the normocoiled group and 0% in the hypercoiled group.

Another study was done on post natal coiling index at Jawaharlal Institute of Post graduate Medical Education and Research, Puducherry in 2011. A total of 1000 women were included in the study.

The mean umbilical cord coiling index was 0.24 +/-0.09 coils per cm. This study showed that about 78.3% of the mothers belonged to the normocoiled group, 11.7% belonged to the hypocoiled group and 10% belonged to the hypercoiled group. In this study, age more than 35 years was found to be significantly associated with both hypocoiling and hypercoiling. Hypertensive disorders of pregnancy were significantly associated with hypocoiling. Diabetes mellitus was significantly associated with hypercoiling. Preterm labour and oligohydramnios were significantly associated with hypocoiling and polyhydramnios was associated with hypercoiling. No association was found between umbilical cord coiling index and parity, anaemia, infertility, premature rupture of membranes, prolonged pregnancy or placenta praevia[12].

The results of the already published studies are different from one another. This could be because of the fact that the umbilical cord coiling index changes continuously in utero and these studies where performed at different gestational ages.

The most effective time of measurement of umbilical cord coiling index that would accurately reflect the perinatal outcome is still not known. Studies

are yet to be conducted to compare the coiling indices calculated at various gestational ages and to find the one which reflects better upon the perinatal outcome.

AIM OF THE STUDY

To find out whether coiling index in the late second trimester is associated with adverse perinatal outcome at IOG, Chennai.

MATERIALS & METHODS:

Prospective Analytical study

Period of study:

2011 to 2012

Place of study:

Institute of Obstetrics &Gynaecology, Egmore, Chennai.

Chennai, Ethical Clearance:

The Institutional Ethical Committee clearance was obtained.

Selection of cases:

Antenatal women coming to Institute of Obstetrics and Gynaecology, Chennai for follow up and delivery were included in the study.

Inclusion criteria:

Antenatal women with

- Singleton pregnancy
- Delivering at our institution

Exclusion criteria:

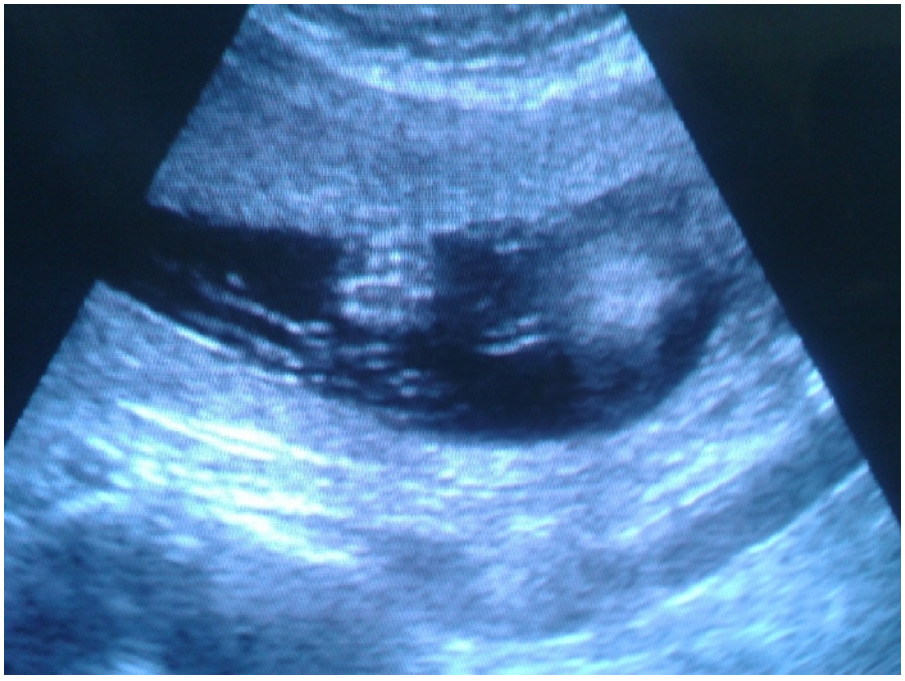
- Multiple pregnancy
- Anomalous babies
- Malpositions
- Single umbilical artery
- Previous cesarean section
- Inability to measure coiling index

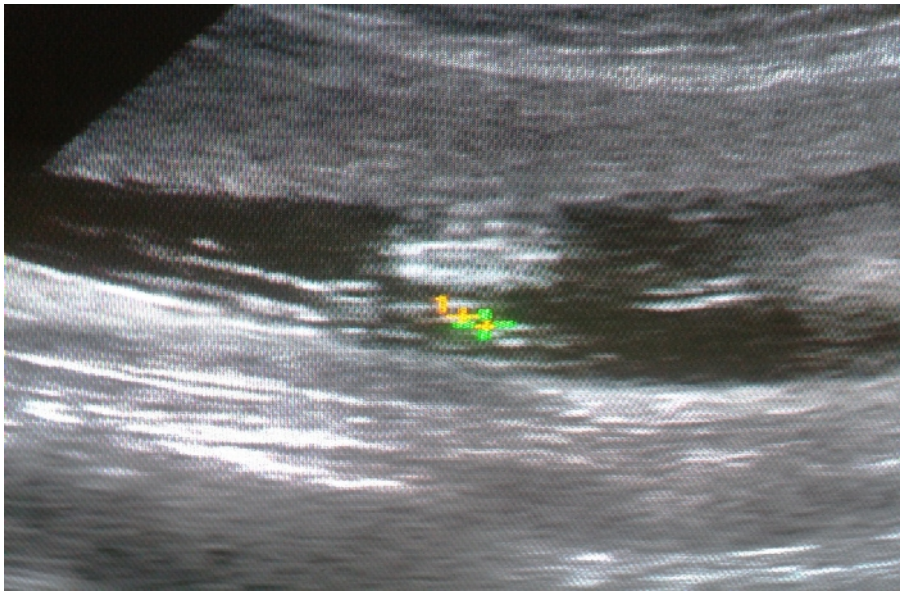
The Umbilical cord coiling index was calculated sonographically between 24-28 weeks.

How to measure umbilical cord coiling index:

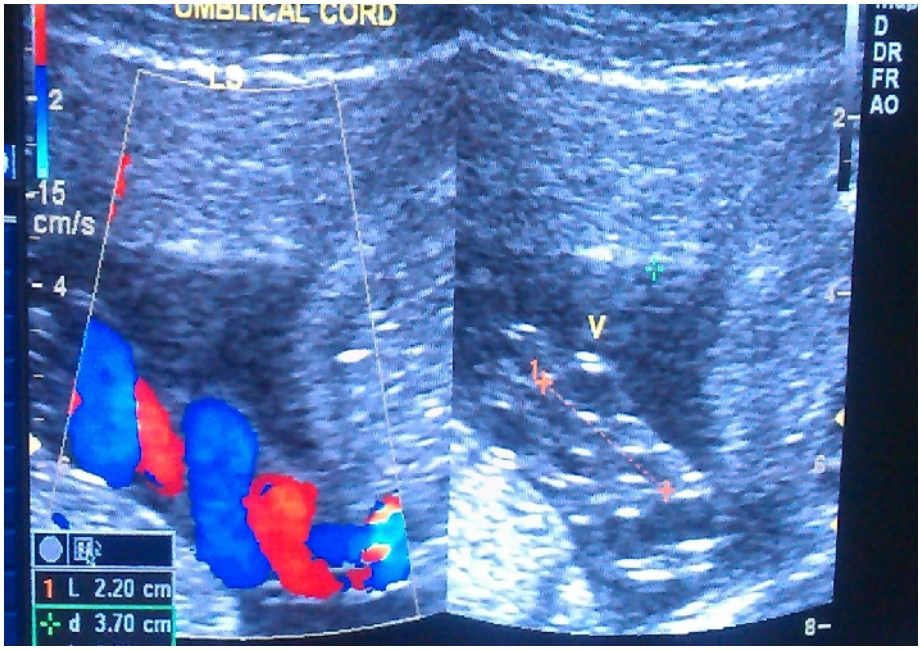
The coiling index was measured using 3.5 MHz transabdominal transducer. Longitudinal images of the umbilical cord were taken. That part of the cord which was freely floating in the amniotic fluid was taken, and the coiling index was calculated using the method suggested by Degani et al. The distance between the coils was measured , along 1 side of the umbilical cord from outer edge of the arterial or venous wall to the next coil.The reciprocal of this distance in cm gives the antenatal coiling index.

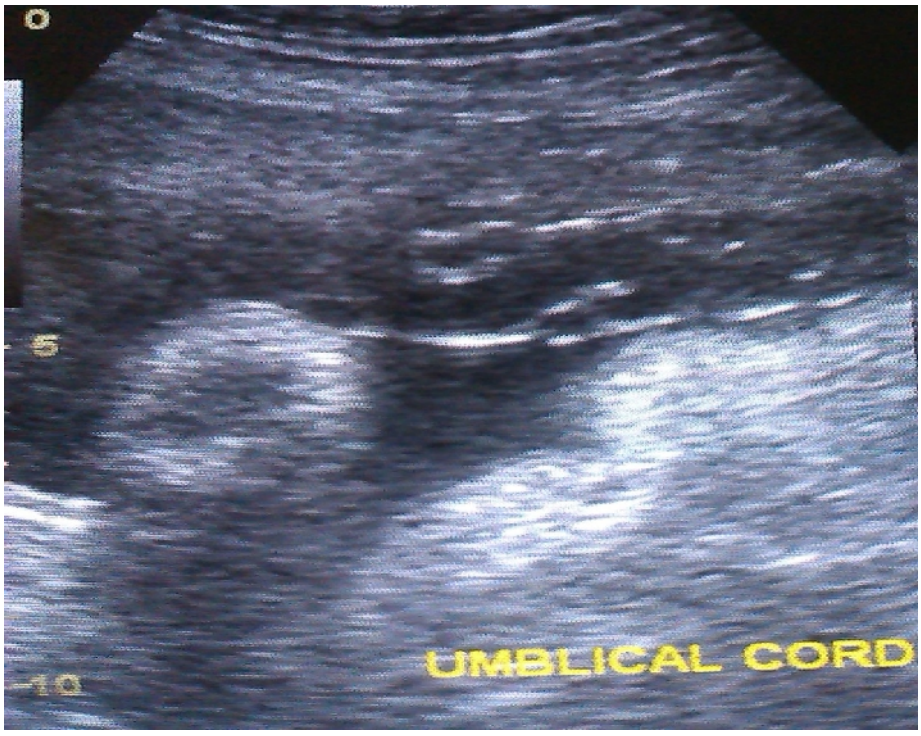
Measurement Of Coiling Index:





This picture shows the umbilical cord and the coils in it. The distance between two coils has been measured.





This shows the coils in the umbilical cord as seen in the Doppler.

The age, obstetric score, presence of pregnancy induced hypertension, gestational diabetes mellitus, medical disorders and labour details like gestational age at delivery, fetal heart rate patterns on a cardiotocograph, colour of liquor, mode of delivery, birth weight, APGAR at 1 min and 5 mins and admission to NICU were noted.

Gestational age:

The gestational age was calculated using the Naegle's rule (ie) by adding 9 months and 7 days to the last menstrual period. If the women was not sure of dates or if there was a discrepancy of more than 7 days between the gestational age calculated by Naegle's rule and that assigned by first trimester ultrasound, then the gestational age as assigned by 1^{st} trimester ultrasound was taken into consideration.

Hypertensive disorders of pregnancy:

This includes:

1. Gestational hypertension
2. Pre eclmpsia and eclampsia
3. Pre eclmpsia super imposed on chronic hypertension

4. Chronic hypertension

Gestational hypertension:

Gestational hypertension is defined as systolic blood pressure > 140 mmHg or diastolic pressure > 90 mmHg without proteinuria, after 20 wks of gestation, in a women with a previously normal blood pressure, measured on 2 separate occasions, at least 6 hours apart.

Pre eclampsia:

1) Minimum criteria:

- BP ≥ 140/90 mmHg after 20 weeks of gestation.
- Proteinuria ≥ 300 mg / 24 hrs or ≥ 1 + dipstick.

2) Others:

- Serum creatinine> 1.2 mg / dl
- Platelets < 1,00,000 / ul
- Microangiopathic hemolysis – increased LDH.
- Elevated serum transaminase levels – ALT or AST
- Persistent headache & visual disturbance
- Persistent epigastric pain

Eclampsia:

Seizure that cannot be attributed to other causes in a women with pre eclampsia.

Chronic hypertension

- BP ≥ 140/90 mmHg before pregnancy or diagnosed before 20 weeks gestation not attributable to gestational trophoblastic disease.

  The effect of chronic hypertion on the coiling index was studied separately.

Superimposed pre eclampsia on chronic hypertension:

- New onset proteinuria ≥ 300mg/24hr in hypertensive women but no proteinuria before 20 weeks gestation.
- A sudden increase in proteinuria or blood pressure or platelet count < 1,00,000/µl in women with hypertension and proteinuria before 20 weeks gestation.

Pre eclampsia results in increased collagen fibres within the walls of the arteries which alters the compliance of the arterial walls . This may be partly responsible for decreased umbilical flow in these pregnancies.

Gestational diabetes mellitus:

This is defined as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy.[2]

Immense metabolic changes occur in the carbohydrate, protein and lipid metabolism in normal pregnant individual, which are instrumental in increasing the nutrient supply to the fetus as well as augment maternal body stores to meet the demands of pregnancy and lactation.

Mothers were screened for GDM with oral glucose challenge test using 75g of glucose and blood glucose measured after 2 hours. Cut off of 140 mg/dl was used and those with blood sugar > 140 mg/dl were subjected to glucose tolerance test with 100gms of glucose and fasting, 1 hour, 2 hours and 3 hours blood glucose levels were measured. This test was performed after an overnight fast of at least 8 hours but not more than 14 hours and after at least 3 days of unrestricted diet (≥ 150g of carbohydrate / day).

Venous plasma glucose levels	
Fasting	95mg/dl
1 hr	180mg/dl
2 hr	155mg/dl
3 hr	140mg/dl

Two or more value above this limit should be met to diagnose a patient as gestational diabetes mellitus.

Medical disorders:

The presence of various medical disorders like anemia, epilepsy, thyroid disorder, heart disease, type 2 diabetes and chronic hypertension were noted from the previous medical records.

Anemia was defined as the hemoglobin less than 11g/dl in the first and third trimester and < 10.5g/dl in the second trimester. Of all the changes in the maternal physiology during pregnancy, those in the hematological system are perhaps the most dramatic.

Pregnancy is associated with major changes in the physiology of the pituitary thyroid axis, iodine metabolism and immune function . It is not therefore surprising that thyroid dysfunction arises frequently in relation to pregnancy. The incidence of overt thyroid dysfunction in pregnancy is 1-2%.

TSH reference range used in the first trimester should be lower than non pregnant values. Upper limit for the first trimester should be taken as 2.5 mU/L. The total T4 rises early in pregnancy to 1.5 times its non pregnant levels and remains stable thereafter. The non pregnant values should therefore be multiplied by a factor of 1.5 to obtain normal values for pregnancy.

Colour of Liquor:

The colour of the liquor was noted during the process of delivery. Any degree of meconium staining of the liquor was taken into account.

Abruption:

This is defined as premature separation of a normally situated placenta. The overall incidence is about 1 in 150 deliveries. This is one form of antepartum haemorrhage where the bleeding can be either revealed or concealed.

Hypertensive disorder of pregnancy is the most important predisposing factor. Depending on the extent of placental separation , it may cause significant maternal and perinatal mortality.

Intra uterine death:

Literally intra uterine embraces all fetal deaths weighing 500 grams or more occurring both during pregnancy (antepartum death) and during labour (intrapartum death). The fetal deaths are related to maternal, placental or fetal complications. These complications can be acute or chronic , the latter being more common. However in about 25 -35% of the cases the cause remains unknown.

Fetal heart rate abnormalities:

A cardiotocograph was taken for all patients in labour. The cardiotocographs were interpreted using NICE (2007) guidelines and classified as normal, suspicious or pathological. Suspicious & pathological CTG were considered as abnormal.

Mode of delivery:

Normal vaginal delivery, forceps and vacuum were all included under vaginal deliveries. Emergency caesarean sections done for any indication was noted. Elective caesarean done for breech ,CPD major or any other indications were excluded from the study.

Birth Weight and sex of the baby:

The babies were weighed immediately after delivery and birth weight of less than 2.5 kg was considered as low birth weight. The sex of the baby was noted to study the association between coiling index and the sex of the baby.

APGAR Scores:

APGAR scores were noted at 1 min and 5 mins after delivery. AnAPGAR of< 7 was considered significant.

	colour	**Heart rate**	**Respiration**	**Reflex response**	**Muscle tone**
0	Pale or blue	absent	absent	absent	Absent
1	Body pink, extremities blue	<100	irregular	Grimace or noticeable facial movements	Some flexion of extremities
2	Body and extremities pink	>100	Good breathing and crying	Coughs, sneezes or pulls away	Active and spontaneous movement of limbs

Admission of NICU:

The babies being admitted to NICU for various reasons like respiratory distress, low birth weight and pre maturity were noted.

After collecting the data, the mean coiling index was calculated. Coiling index less than the 10^{th} percentile was considered as hypocoiled and that above 90^{th} percentile was considered as hypercoiled.

RESULTS & ANALYSIS:

385 women were recruited in the second trimester and umbilical cord coiling index was determined using ultrasonogram between 24 and 28 weeks. There was difficulty in calculating the coiling index in 14 women due to inability to achieve appropriate imaging of the umbilical cord. 62 women did not come back to our institution for delivery. 9 other women who underwent elective caesarean sections for breech, placenta praevia and CPD major were excluded from the study.Hence 300 mothers who met the inclusion criteria were recruited in the study group. The mean coiling index was 0.38.They were divided into 3 groups based on the umbilical coiling index as normocoiled, hypocoiled andhypercoiled.

Normocoiled → umbilical coiling index is between 10^{th} – 90^{th} percentile.

Hypocoiled → umbilical coiling index is less than the 10 percentile.

Hypercoiled → umbilical coiling index is more than the 90^{th} percentile

Of the 300 women included in the study, about 226 women were in the normocoiled group, 37 women in the hypocoiled group, and 37 women in the hypercoiled group.

The various parameters like the age, parity, presence of hypertensive disorders of pregnancy, gestational diabetes mellitus and other medical

disorders, gestational age at delivery, meconium stained liquor, abnormal fetal heart patterns, abruption, intra uterine death, birth weight and admission to NICU were compared with the umbilical coiling index.

The datas were analysedusing SPSS software, version 16. Chi square test was used to compare data and a P value < 0.05 was considered to be statistically significant.

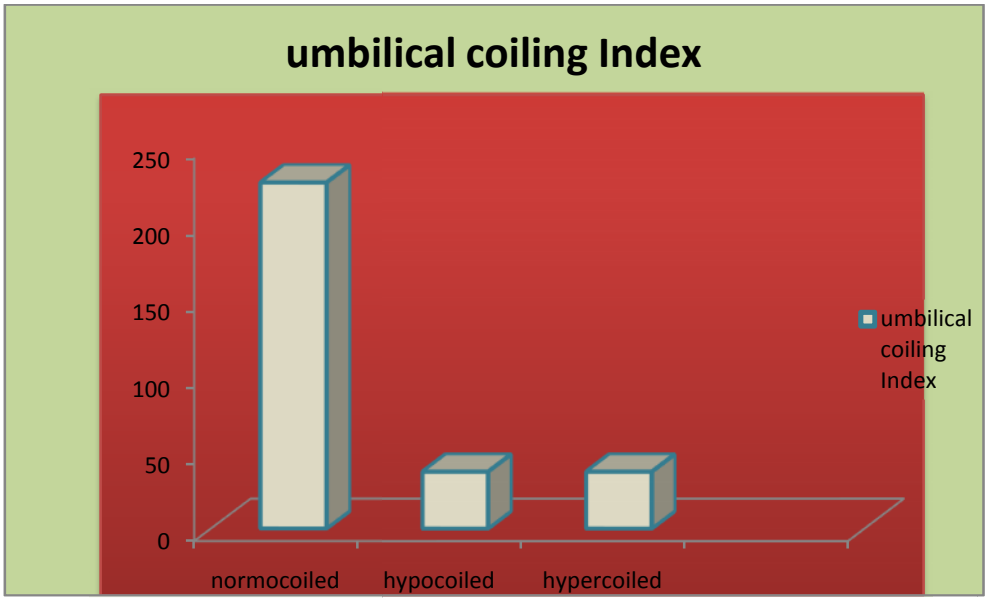
Of the 300 women included in the study about 226 women whose coiling index was between the 10 th and the 90 thpercentiles belonged to the normocoiled group. 37 women with coiling index less than the 10^{th} percentile belonged to the hypocoiled group. 37 women with coiling index more than the 90 th percentile belonged to the hypercoiled group.

Thus 75.33% of the study population was normocoiled , 12.33 % was hypocoiled and another 12.33% was hypercoiled.

TABLE -1

Coiling index

Coiling index	Total number	Percentage
Normocoiled	226	75.33
Hypocoiled	37	12.33
Hypercoiled	37	12.33

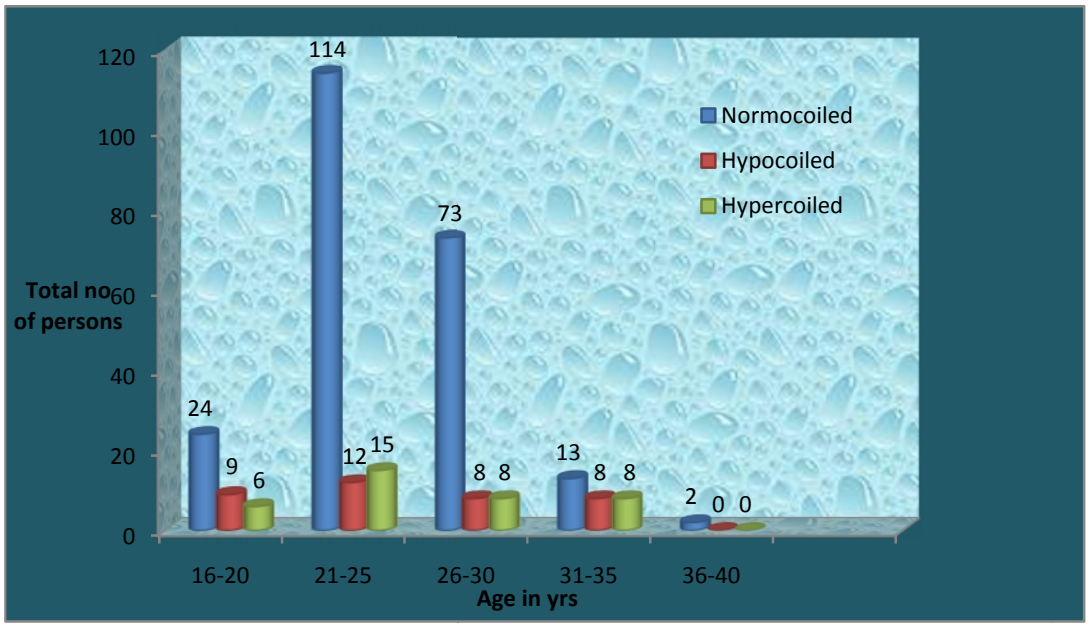


This bar diagram shows that 236 women belonged to the normocoiled group, 37 belonged to the hypocoiled group and another 37 belonged to the hypercoiled group.

TABLE -2

AGE DISTRIBUTION

Age (in yrs)	Normocoiled	Hypocoiled	Hypercoiled	Total	P value
16-20	24	9	6	39 (13%)	
21-25	114	12	15	141 (47%)	
26-30	73	8	8	89 (29.7%)	0.002
31-35	13	8	8	29 (9.7%)	
36-40	2	0	0	2 (0.7%)	

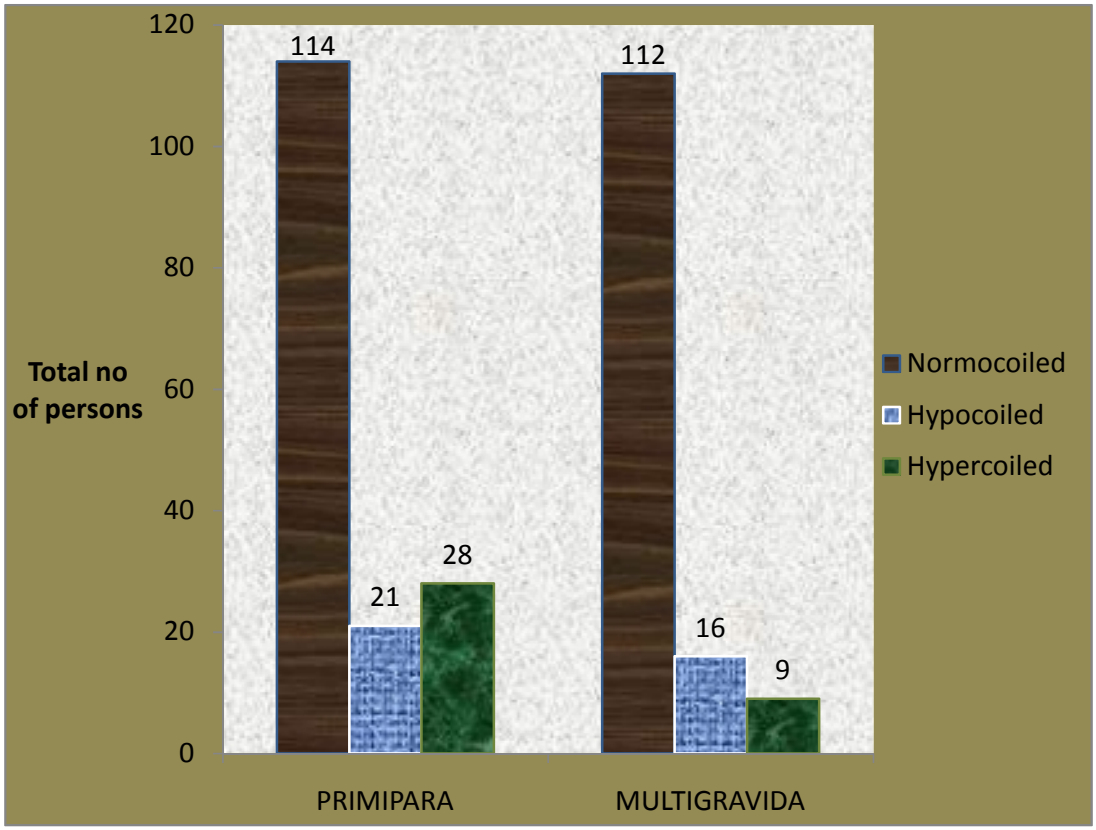


This shows that 47% of the study population were between 21 -25 years of age, 29.7% were between 25 – 30 years of age, 13% were between 16-20years of age, 9.7%were 31-35 years of age and 0.7% were more than 35 years of age.

TABLE - 3

PARITY

PARITY	Normocoiled	Hypocoiled	Hypercoiled	Total	P value
PRIMIPAROUS	114	21	28	163 (54.3%)	0.128
MULTIGRAVIDA	112	16	9	137 (45.7%)	

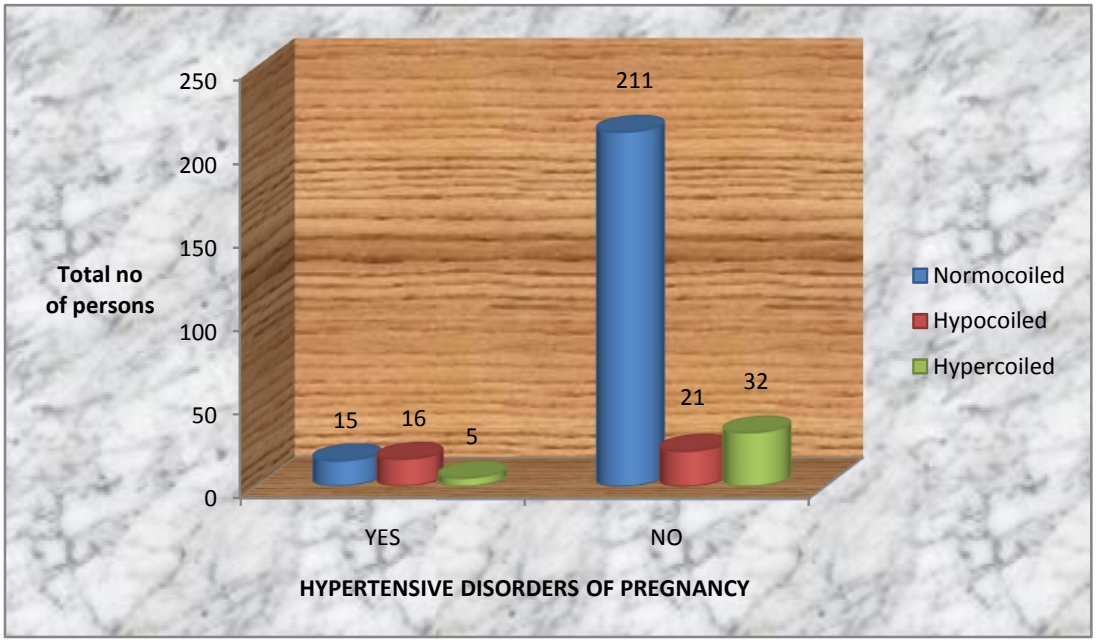


There were a total of 163 primigravidas and 137 multigravidas included in the study. There was no significant difference in the coiling index between the two groups.

TABLE - 4
ASSOCIATION WITH HYPERTENSIVE DISORDERS OF PREGNANCY

	HYPERTENSIVE DISORDER OF PREGNANCY				P value
	YES		NO		
	Total	Percentage	Total	Percentage	
Normocoiled	15	6.6	211	93.4	
Hypocoiled	16	43.2	21	56.8	< 0.001**
Hypercoiled	5	13.5	32	86.5	

Note : ** means significant at 1% level.

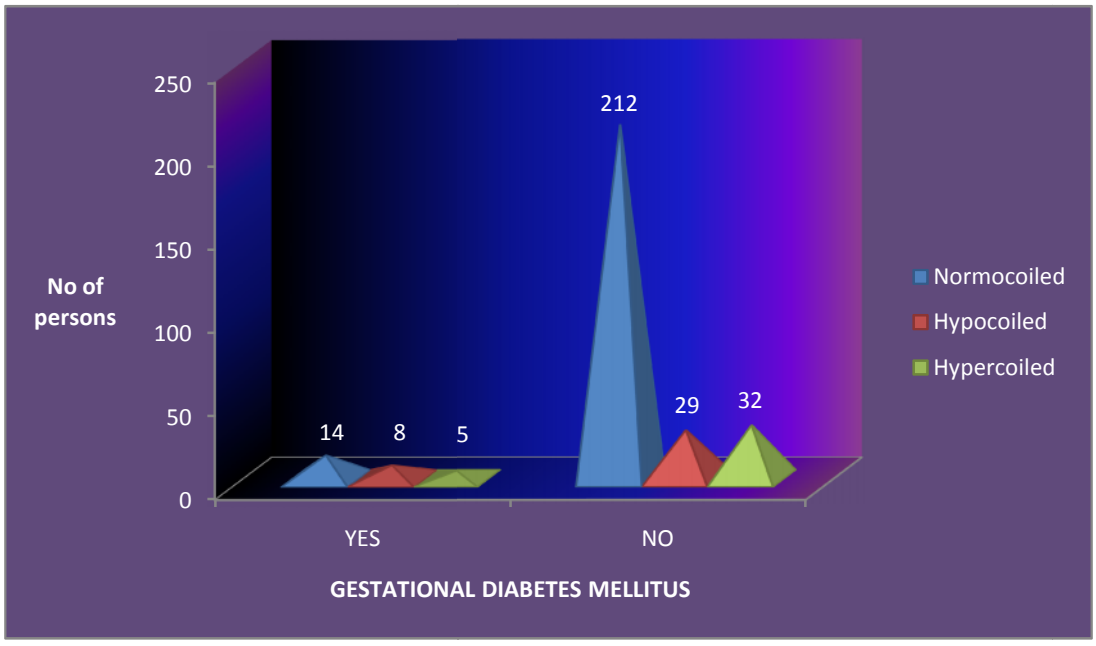


This shows that 43.2% of the hypocoiled group had hypertensive disorders when compared to only 6.6% in the normocoiled group.

TABLE - 5

ASSOCIATION WITH GESTATIONAL DISBETES MELLITUS

	GESTATIONAL DISBETES MELLITUS				P value
	YES		NO		
	Total	Percentage	Total	Percentage	
Normocoiled	14	6.2%	212	93.8%	
Hypocoiled	8	21.6%	29	78.4%	0.006**
Hypercoiled	5	13.5%	32	86.5%	

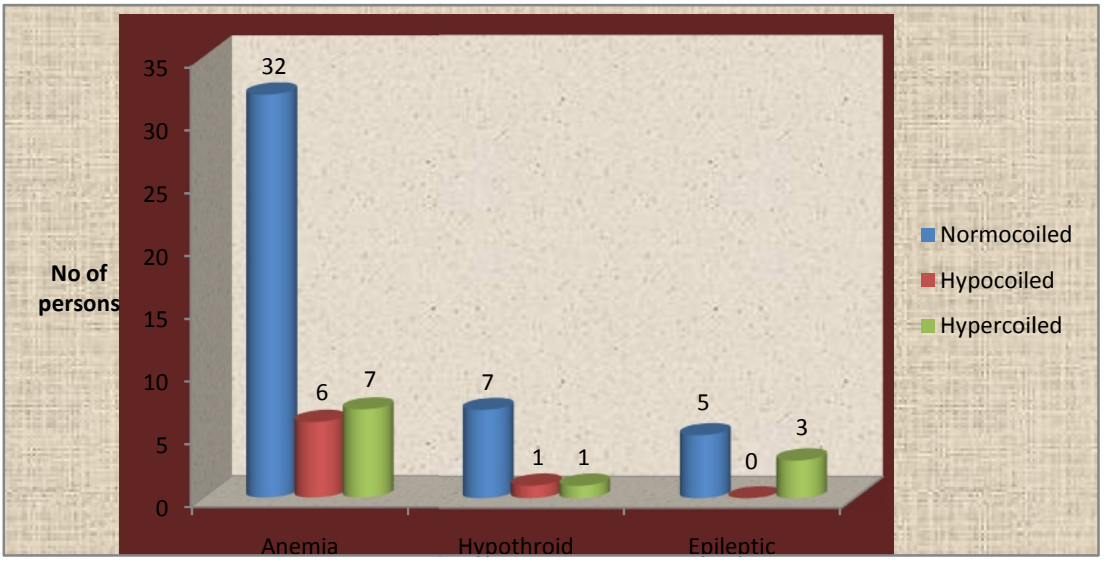


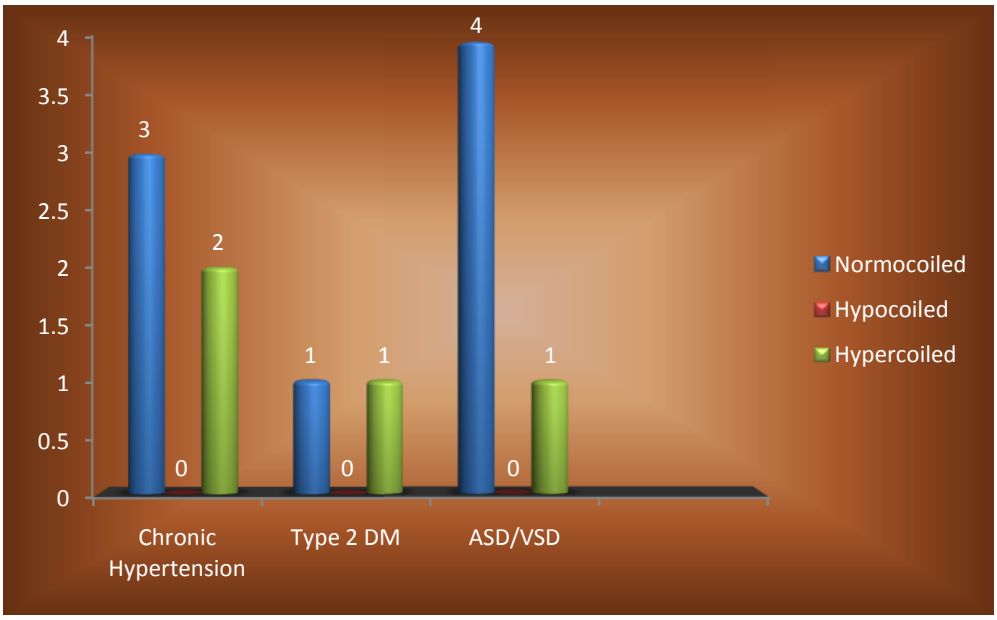
This shows that 21.6% in the hypocoiled group and 13.5% in the hypercoiled group had GDM in comparison to only 6.2% in the normocoiled group.

TABLE - 6

ASSOCIATION WITH OTHER MEDICAL DISORDERS

MEDICAL DISORDERS	Normocoiled	Hypocoiled	Hypercoiled	Total	P value
Anaemia	32	6	7	45	0.693
Hypothyroid	7	1	1	9	
Epilepsy	5	0	1	6	
Chronic hypertension	3	0	2	5	
Type 2 diabetes mellitus	1	0	1	2	
Atrial septal defect/ventricular septaldeptal	4	0	1	5	





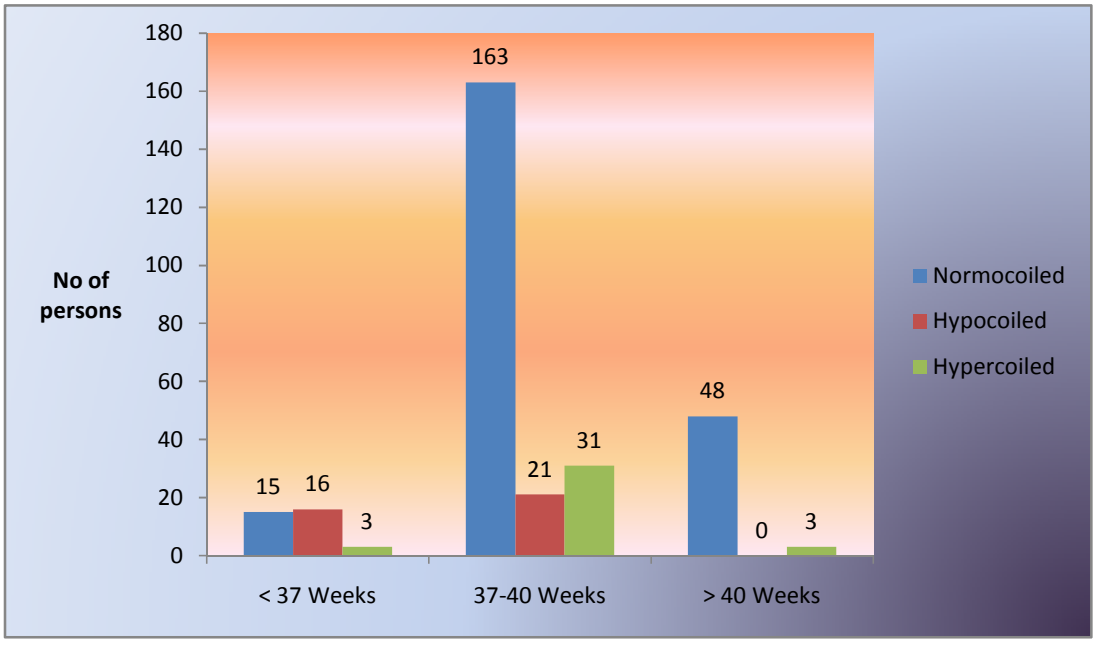
This shows that there were 45 cases of anaemia in the study group of which 32 were normocoiled, 6 were hypocoiled and 7 were hypercoiled. Out of the 9 cases of hypothyroidism 7 were normocoiled , 1 was hypocoiled and 1 washypercoiled. Of the 6 cases of epilepsy, 5 were normocoiled and 1 was hypercoiled . In contrast to pregnancy induced hypertension, none of the cases of chronic hypertension were hypocoiled.Of the 5 cases ,3 were normocoiled and 2 were hypercoiled. Among the 2 cases of type2 diabetes 1 was normocoiled and 1 was hypercoiled. Among the 5 cases of congenital heart disease 4 were normocoiled and 1 was hypercoiled.

TABLE - 7

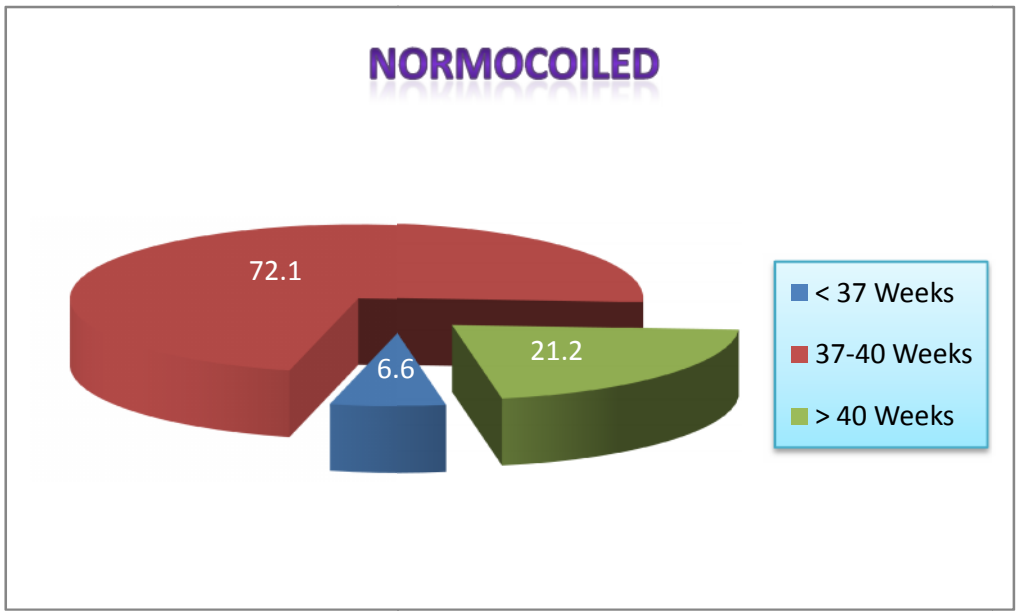
GESTATIONAL AGE AT DELIVERY

	GESTATIONAL AGE AT DELIVERY			Total	P value
	< 37 weeks	37-40 weeks	> 40 weeks		
Normocoiled	15 (6.6%)	163 (72.1%)	48 (21.2%)	226	<0.001**
Hypocoiled	16 (43.2%)	21 (56.8%)	0(0)	37	
Hypercoiled	3 (8.1%)	31 (83.8%)	3 (8.1)	37	

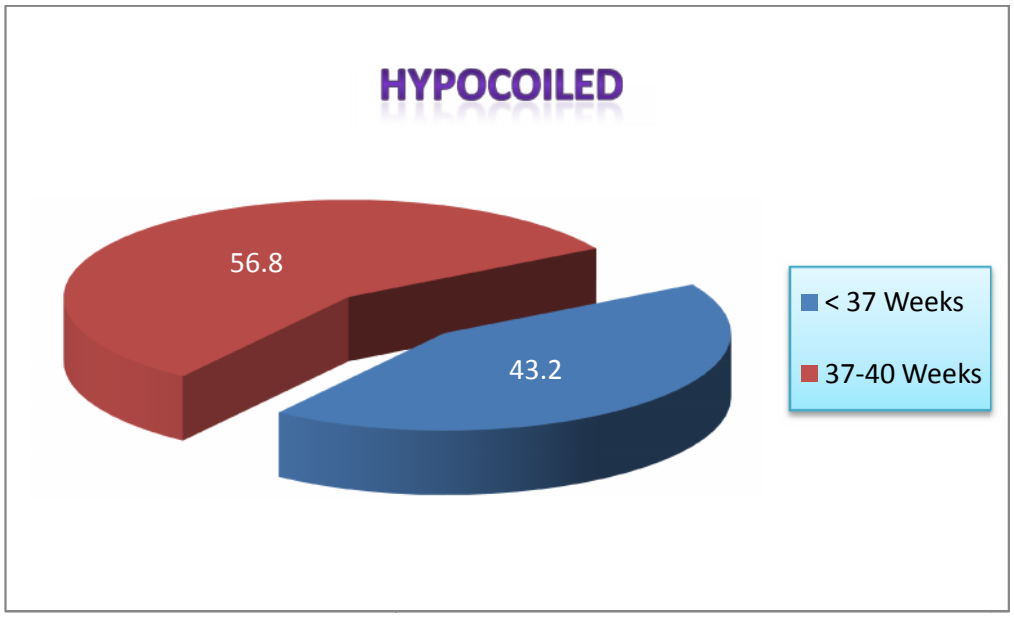
Note : ** means significant at 1% level.



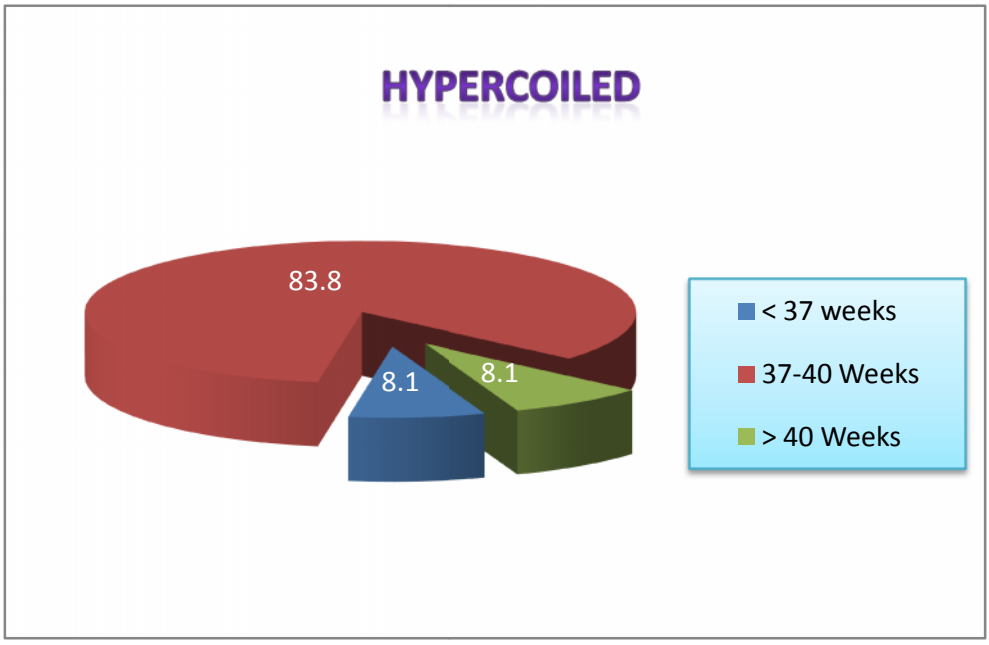
This shows that 16 women in the hypocoiled group delivered before 37 weeks of gestation. Thus 43.2% of the women in hypocoiled group delivered before 37 weeks.



This shows that 6.6% of the women in the normocoiled group delivered before 37 weeks of gestation.



This shows that 43.2% of the hypocoiled group delivered before 37 weeks of gestation.



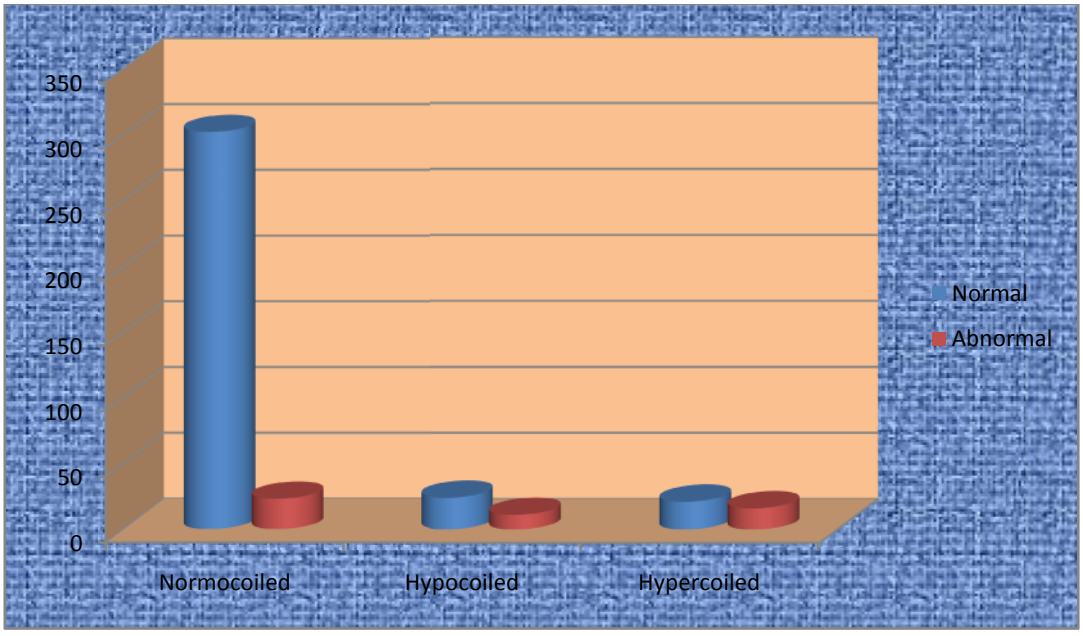
This shows that 8.1% of the hypercoiled group delivered before 37 weeks of gestation, 83.8% delivered between 37 -40 weeks of gestation and 8.1% delivered after 40 weeks of gestation.

Thus preterm labour was more common in the hypocoiled group. There was significant association between preterm labour and hypocoiling.

TABLE - 8

CTG

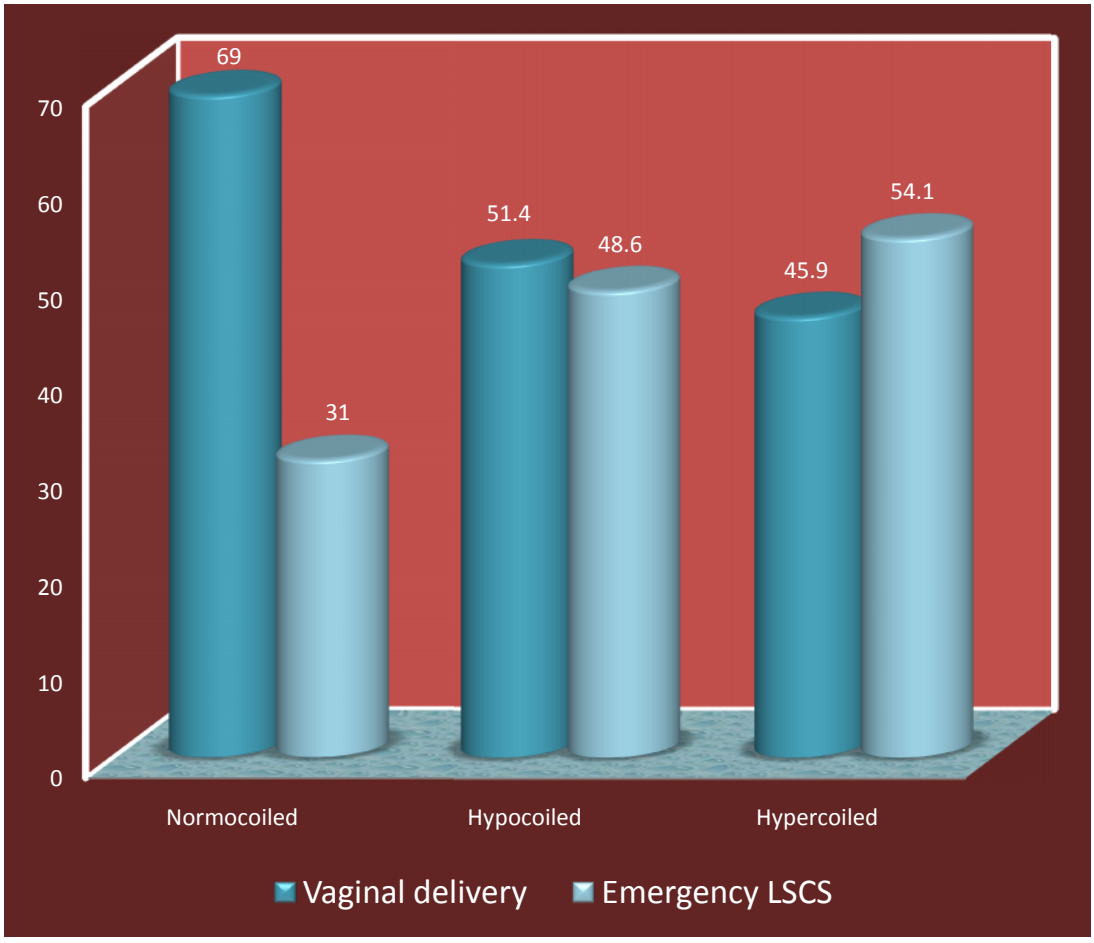
	NORMAL	ABNORMAL	P VALUE
Normocoiled	302	23(10.2%)	**<0.001**
Hypocoiled	24	11(29.7%)	
Hypercoiled	21	16(43.2%)	



Of the 326 women in the normocoiled group, 10.2% had an abnormal CTG. About 29.7% in the hypocoiled group and 43.2% in the hypercoiled group had abnormal CTG

TABLE - 9
MODE OF DELIVERY

Mode of delivery	Vaginal delivery	Emergency LSCS	Total	P value
Normocoiled	156 (69%)	70 (31%)	226	0.002
Hypocoiled	19 (51.4%)	18 (48.6%)	37	
Hypercoiled	17 (45.9%)	20 (54.1%)	37	



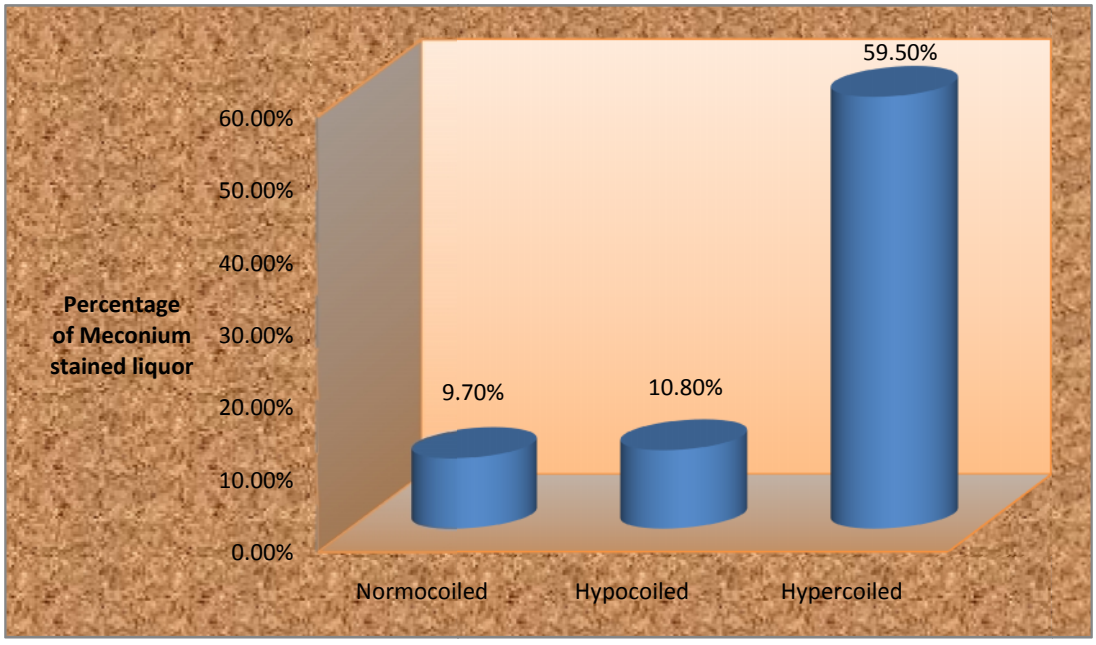
This shows that 48.6% of the hypocoiled group and 54.1% of the hypercoiled group delivered by caesarean section.

TABLE - 10

INCIDENCE OF MECONIUM STAINED LIQUOR

	MECONIUM				TOTAL	P value
	YES		NO			
	Total	Percentage	Total	Percentage		
Normocoiled	22	9.7%	204	90.3%	226	<0.001**
Hypocoiled	4	10.8%	33	89.2%	37	
Hypercoiled	22	59.5%	15	40.5%	37	

Note : ** means significant at 1% level.

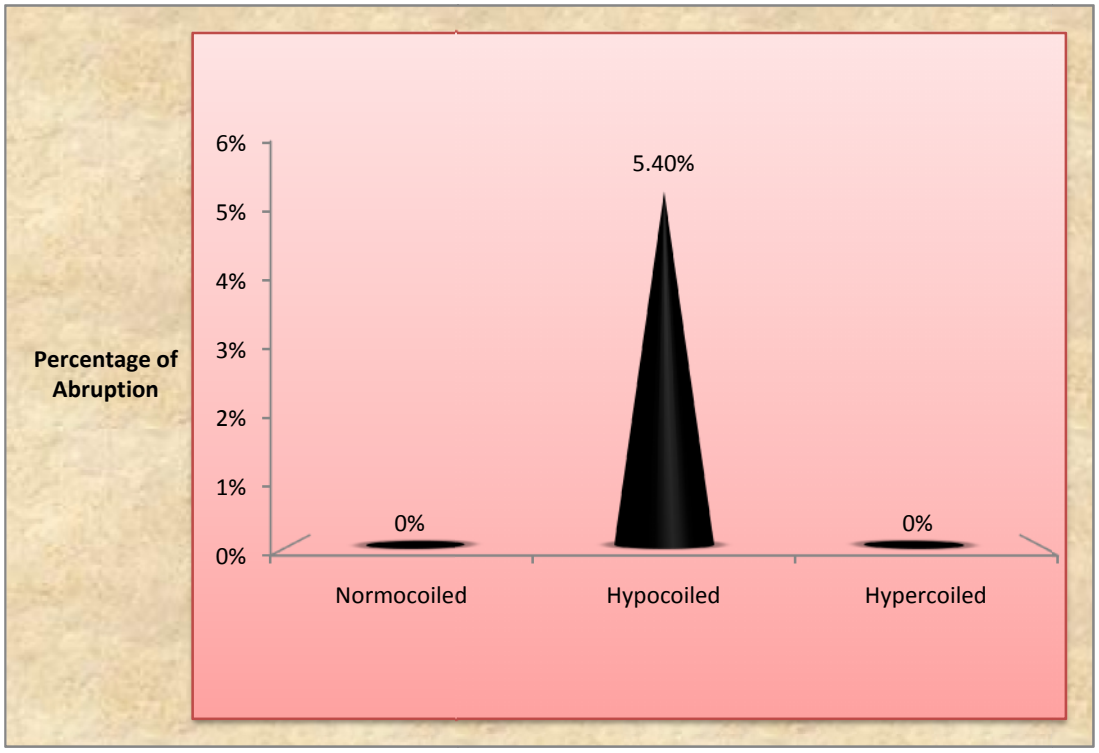


This shows that 59.5% of the hypercoiled group had meconium staining of liquor in contrast to 9.7% in the normocoiled group.

TABLE - 11

INCIDENCE OF ABRUPTION

	ABRUPTION				Total	P value
	YES		NO			
	Total	Percentage	Total	Percentage		
Normocoiled	0	0%	226	100%	226	0.001
Hypocoiled	2	5.4%	35	94.6%	37	
Hypercoiled	0	0%	37	100%	37	

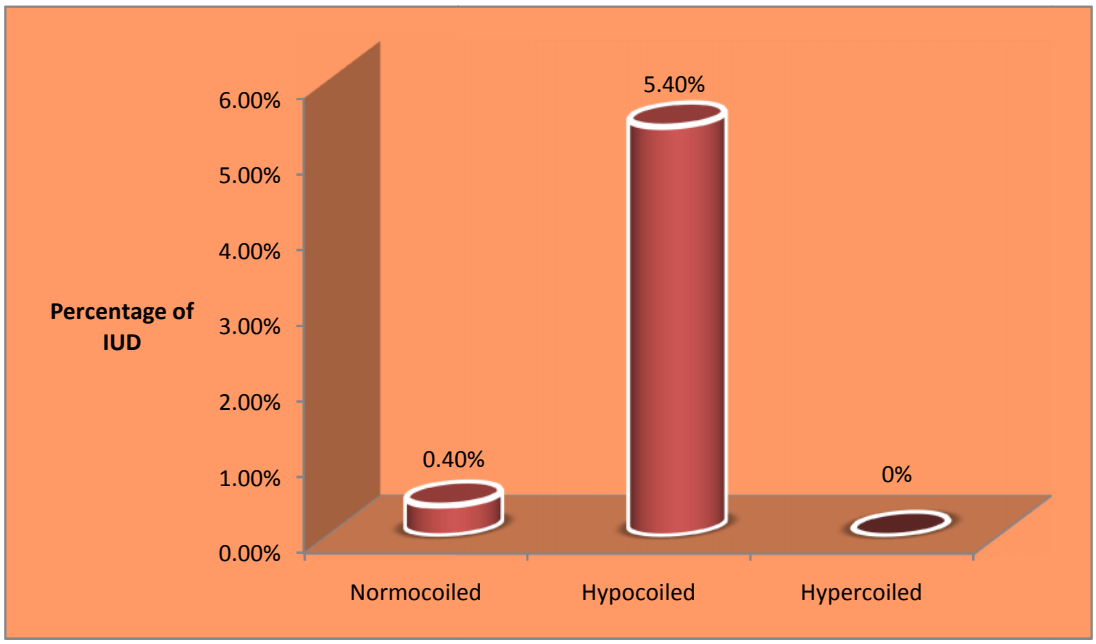


This shows a 5.4% incidence of abruption in the hypocoiled group.

TABLE - 12

INCIDENCE OF INTRA UTERINE DEATH (IUD)

	IUD				Total	P value
	YES		NO			
	Total	Percentage	Total	Percentage		
Normocoiled	1	0.4%	225	99.6%	226	0.015
Hypocoiled	2	5.4%	35	94.6%	37	
Hypercoiled	0	0	37	100%	37	



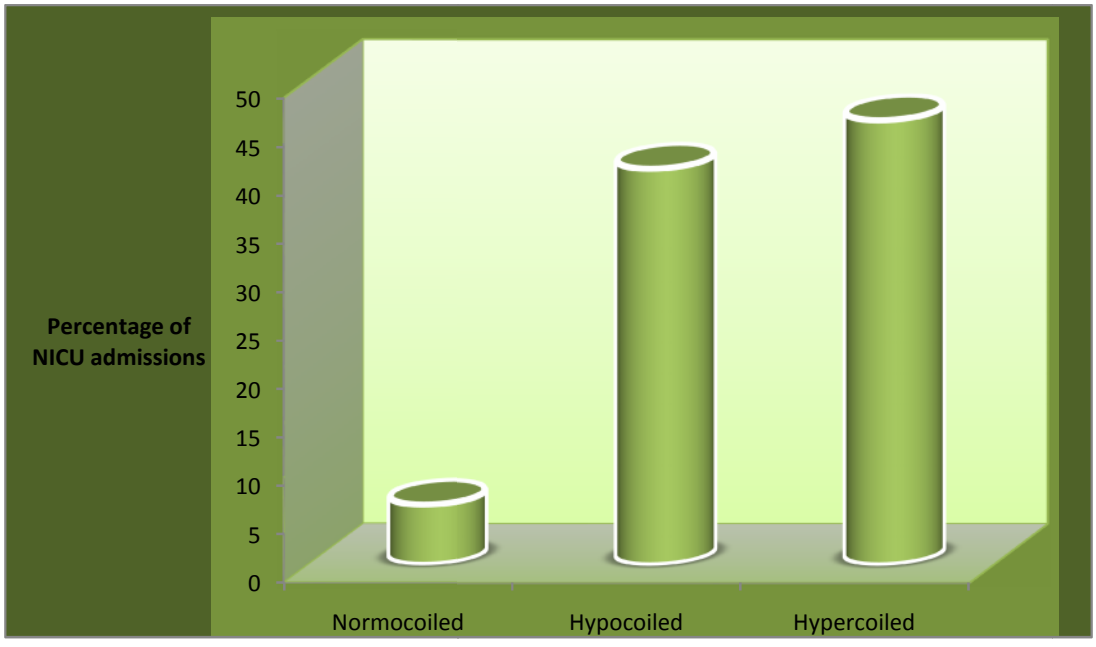
This shows a 5.4% incidence of intra uterine death in the hypocoiled group.

TABLE - 13

ADMISSION TO NICU

	ADMISSION TO NICU				Total	P value
	YES		NO			
	Total	Percentage	Total	Percentage		
Normocoiled	14	6.2%	212	93.8%	226	
Hypocoiled	15	40.5%	22	59.5%	37	0.001**
Hypercoiled	17	45.9%	20	54.1%	37	

Note : ** means significant at 1% level.

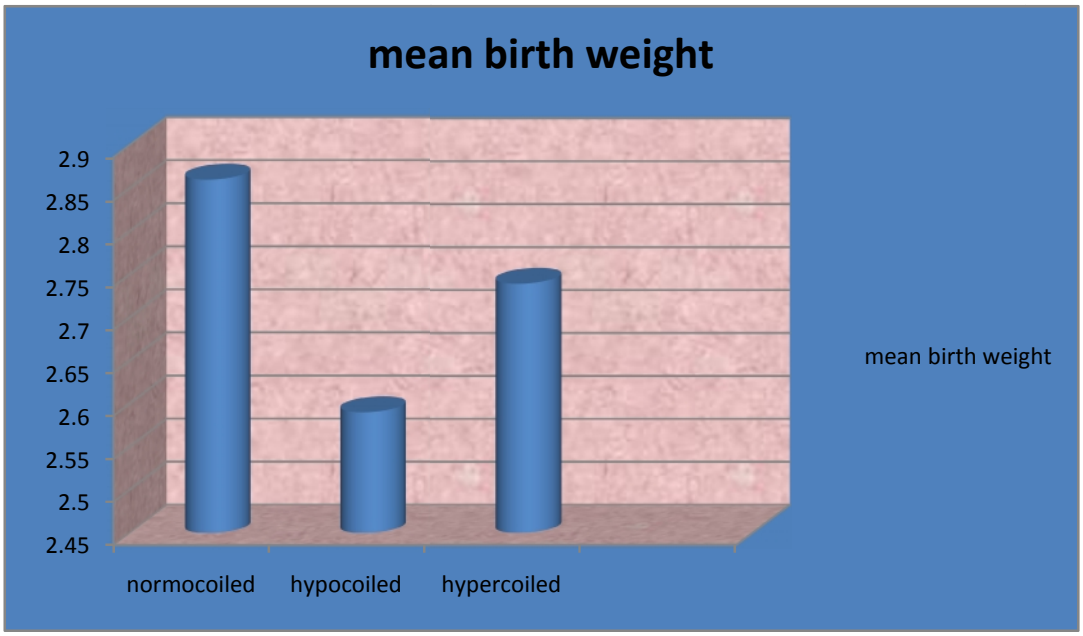


The admission to NICU was 45.9% and 40.5% in the hypercoiled and the hypocoiled groups respectively.

TABLE - 14

BIRTH WEIGHT

	MEAN BIRTH WEIGHT	STD DEVIATION
Normocoiled	2.86	0.34351
Hypocoiled	2.59	0.70217
Hypercoiled	2.74	0.45350

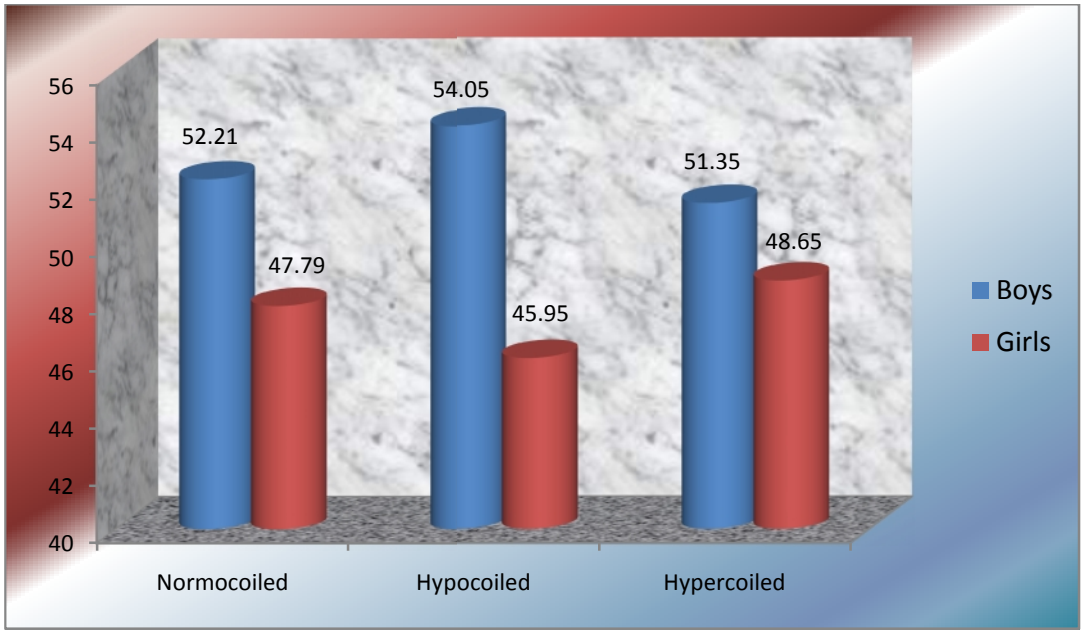


The mean birth weight in the hypocoiled group was 2.59 kg in contrast to 2.86 kg in the normocoiled group.

TABLE –15

SEX OF THE BABY

	Boys		Girls	
	total	**%**	**total**	**%**
Normocoiled	118	52.21	108	47.79
Hypocoiled	20	54.05	17	45.95
Hypercoiled	19	51.35	18	48.65

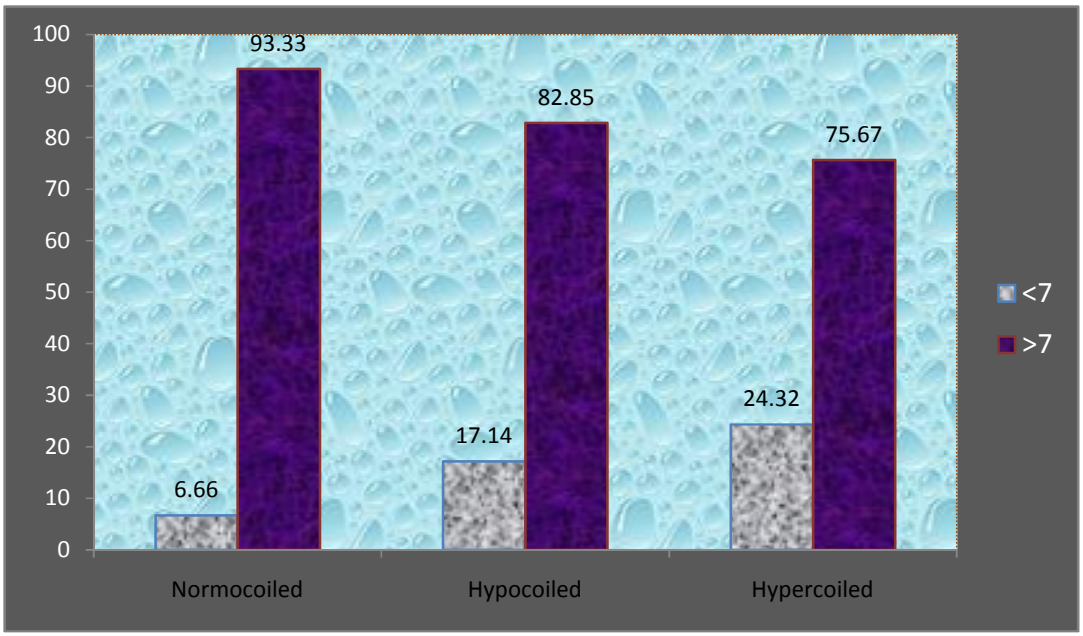


There was no significant difference in the coiling index between boy and girl babies.

TABLE - 16

APGAR AT 1 MIN

	<7		>7	
	Total	**%**	**total**	**%**
Normocoiled	15	6.66	210	93.33
Hypocoiled	6	17.14	29	82.85
Hypercoiled	9	24.32	28	75.67



17.4% of the hypocoiled group and 24.32% of the hypercoiled group had an APGAR < 7 at 1 min after birth.

TABLE - 17

		N	Mean	Std. Deviation
Age in years	Normo Coiled	226	24.74	3.752
	Hypo	37	25.19	5.158
	Hyper	37	24.89	4.937
	Total	300	24.82	4.093
GA at delivery	Normo Coiled	226	38.46	1.427
	Hypo	37	36.24	2.510
	Hyper	37	38.03	1.118
	Total	300	38.14	1.723
Baby weight in kg	Normo Coiled	226	2.8678	.34351
	Hypo	37	2.5973	.70217
	Hyper	37	2.7446	.45350
	Total	300	2.8192	.42601

This table shows that the mean gestational age at delivery in the hypocoiled group was 36.24 weeks in contrast to 38.46 weeks in the normocoiled group. The average birth weight in the hypocoiled group was 2.59 kg in comparison to 2.86 kg in the normocoiled group.

DISCUSSION

A prospective study was done at Institute of obstetrics and gynecology on the sonographic evaluation of umbilical cord coiling index in late second trimester and its effects on the perinatal out come.

300 mothers who met the inclusion criteria were included in the study. Coiling index was determined using ultra sound between 24-28 weeks. The various factors like age, parity, presence of hypertensive disorders of pregnancy, gestational diabetes mellitus & other medical disorders, meconium staining of liquor, CTG abnormalities, abruption, intra uterine death, birth weight, APGAR and admissions to NICU were noted. The association between these factors and the umbilical cord coiling index were analysed using chi square tests & p value < 0.05 was considered statistically significant.

The mean coiling index in the study group was 0.38. Of the 300 women included in the study, 226 were found to be normocoiled, 37 were hypocoiled and another 37 were hypercoiled. This accounted for 75.33% of the women in the study group to normocoiled and 12.33% to be hypocoiled and another 12.33% to be hypercoiled.

Age:

In this study population about 39 women were under 20 years of age and 31 women were over 30 years of age. There were only 2 women over 35 years of

age. 23.1% of the patients less than 20 years of age and 27.6 % of patients more than 30 years were hypocoiled. This was in contrast to only 8.25% in the 20-30 years age group being hypocoiled.

Similarly , 15.4% of patients less than 20 years of age and 27.6% of patients more than 30 years of age were hypercoiled . This was in contrast to apporoximately 10 % in the 20-30 yrs age group being hypercoiled.

Hence both hypocoiling and hypercoiling were common in the patients who were less than 20 years of age and in those who were more than 30 years of age. This association was statistically significant with a p value of 0.002.

Age more than 35 yrs was found to be significantly associated with hypocoiling and hypercoiling by Chitra et al[12]. Ezhimokhai et al found hypocoiling to be associated by extremes of age (< 20 and > 35) [20].

Parity:

In this study , there were 163 primigravidas and 137 multigravidas . Among the 163 primigravidas included in the study, about 144 belonged to the normocoiled group, 21 belonged to the hypocoiled group and 28 belonged to the hypercoiled group. Among the 137 multigravidas, 112 belonged to the normocoiled group, 16 belonged to the hypocoiled group and 9 belonged to the hypercoiled group. There was no significant association between parity and umbilical coiling index.

Similar results were shown by many authors including Chitra et al[12].

Hypertensive disorders of pregnancy:

About 36 women in the study group had hypertensive disorders of pregnancy, of which 15 belonged to the normocoiled group, 16 belonged to hypocoiled group and the remaining 5 belonged to hypercoiled group. This accounted for about 43.2% of patients in the hypocoiled group who were found to have hypertensive disorder of pregnancy. This was in contrast to 6.6% in the normocoiled group and 13.5% in the hypercoiledgroup .

Hence there was a statistically significant association between hypocoiling and hypertensive disorders of pregnancy. The p value was less than 0.001.Similar results were shown by Shalu Gupta et al, Ezhimokhai et al, Chitra et al and many others[12,14,19,20].

The coiled umbilical cord is able to resist the external forces by its elastic properties and hence does not compromise the umbilical vascular flow. Hence a coiled umbilical cord was more resistant to stretch, compression and torsion with respect to a hypocoiled cord. This explains the association between hypertensive disorders of pregnancy and hypocoiling.

Gestational diabetes mellitus:

In this study group about 27 women were diagnosed to have gestational diabetes mellitus. Of these, 14 belonged to the normocoiled group, 8 belonged to the hypocoiled group and 5 belonged to the hypercoiled group. This accounted for about 21.6 % in the hypocoiled group and 13.5% in the hypercoiled being diagnosed to have gestational diabetes mellitus . this was in contrast to only 6.2% in the normocoiled group.

Thus gestational diabetes mellitus in the mother was found to be significantly associated with both hypocoiling and hypercoiling in this study. The p value was 0.006. Similar results were shown by Ezhimokai et al([19,20]. However Chitra et al found significant association between hypercoiling and diabetes mellitus[(12)].

Medical disorders:

Our study population included 45 women with anaemia, 9 with hypothyroidism, 6 with epilepsy , 3 with ventricular septal defect, 2 with atrial septal defect and 2 with type 2 diabetes. There were 5 women with chronic hypertension of whom 3 were normocoiled and 2 were hypercoiled. None of the medical disorders had any significant association with hypocoiling or hypercoiling. Other studies also show no association between abnormal coiling index and medical disorders.

Gestational age at delivery:

Among the study group, 34 women delivered before 37 weeks of gestation and 51 delivered after 40 weeks of gestation. About 43.2% of the women in the hypocoiled group delivered before 37 completed weeks. This was in comparison to 8.1% in the hypercoiled group and 6.6% in the normocoiled group who delivered before 37 weeks.About 21.2% of the normocoiled group and 8.1% in the hypercoiled group delivered after 40 weeks of gestation.

The mean gestational age at delivery in the normocoiled andhypercoiled groups were 38 weeks 3 days and 38 weeks 1 day respectively. Whereas in the hypocoiled group it was 36 weeks 2 days . There was significant association between hypocoiling and preterm delivery with the p value of less than 0.001 .

Similar results were shown by strong et al and de Laat et al though explanations regarding the cause for preterm delivery were not given[3,10].Whereas Rana et al found preterm deliveries to be associated with hypercoiling[2].

Mode of delivery:

Among the study group , 192 women delivered vaginally and 108 women delivered by emergency caesarean sections . Of these 108 women,

70 belonged to the normocoiled group, 18 belonged to the hypocoiled group and 20 belonged to the hypercoiled group. This accounted to 48.6% of hypocoiled group and 54.1 % of hypercoiled group undergoing emergency caesarean section in contrast to 31% of the normocoiledgroup .

Thus, both hypocoiling and hypercoiling were significantly associated with increased rates of emergency caesarean sections .The p value was 0.006. Many authors have shown the association between operative vaginal deliveries and emergency caesarean section with abnormal coiling index.

Abnormal fetal heart rate patterns:

In the study group 250 women had normal fetal heart rate patternsand 50 had abnormal fetal heart rate patterns during labour. Of these 50 women, 23 belonged to the normocoiled group, 11 belonged to the hypocoiled group and 16 belonged to the hypercoiled group.

This accounted for 29.7% of the hypocoiled group and 43.2% of hypercoiled group who had abnormal fetal heart patterns in comparison to 10.2% of the normocoiled group. Fetal heart rate variations as picked up on a cardiograph were significantly associated with both hypocoiling andhypercoiling. The p value was less than 0.001.

Chitra et al, Strong et al & de Laat et al also showed that fetal heart rate variations were significantly associated with both hypocoiling and hypercoiling[10,12].

This was explained by the fact that hypocoiled&hypercoiled umbilical cords were less flexible and more prone to kinking & torsion. Hence these fetuses do not withstand the stress of labour.

Meconium stained liquor:

Among the study group ,48 women had meconium stained liquor . Of these, 22 belonged to the normocoiled group, 22 belonged to the hypercoiled group and 4 belonged to the hypocoiled group. This accounted for about 59.5% of the women in the hypercoiled group who had meconium staining of the liquor. This was in contrast to 9.7% in the normocoiled group and 10.8% in the hypocoiled group.

There was signigicantassociation between hypercoiling and meconium staining of the liquor. The p value was less than 0.001. Whereas Strong et al &Ezhimokai et al found meconium stained liquor to be significantly associated with both hypocoiling&hypercoiling. No proper explanations were given by either of the authors for the same[3,20].

Abruptio placenta:

There were 2 cases of abruption placenta in the study group and both belonged to the hypocoiled group. Abruption placenta was found to be associated with hypocoiling by Chitra et al[12]. No other authors have shown any such association. This could be because of increased incidence of hypertensive disorders of pregnancy in the hypocoiled group which in turn causes abruption.

Intra uterine death:

In this study,there were 3 cases of intra uterine death of which 2 belonged to the hypocoiled group and 1 belonged to the normocoiled group. There was significant association between hypocoiling and intra uterine death, (P=0.015). This could be because of the compromise of the feto maternal circulation in hypocoiled umbilical cords. No other studies have revealed such association.

Sex of the baby:

In the study group there were a total of 157 boy babies and 143 girl babies. Among the hypocoiledgroup , boys constituted about 54.05% and girls constituted about 46.95%. Among the hypercoiled group, boys constituted about 51.35% and girls constituted about 48.65%. There was no significant association between the sex of the baby and abnormal umbilical cord coiling index.

Birth weight:

The average birth weight of the babies in the hypocoiled group was 2.59 kg, hypercoiled group was 2.74 kg and the normocoiled group was 2.86 kg. there was significant association between low birth weight babies and hypocoiling. The p value was 0.001. The incidence of low birth weight babies in the hypocoiled group could be because of the increased incidence of preterm labour.

Yung sung et al showed similar results. However Rana et al, Raio et al and de Laat et al found low birth weight babies to be significantly associated with hypercoiling[2,10]. Many authors have shown significant association between hypercoiling and intra uterine growth restriction.

Admission to NICU:

Among the babies of the study group, 46 were admitted in new born intensive care unit for various reasons. Of these , 17 belonged to the hypercoiled group, 15 belonged to the hypocoiled group and 14 belonged to the normocoiled group. This accounted for 45.9% of the babies born to mothers of the hypercoiledgroup who were admitted in the NICU and 40.5% of the babies of the hypocoiled group. This was in comparison to 6.2% in the normocoiled group.

Thus admission of babies to the new born unit was more in both the hypocoiled and hypercoiled groups as compared to the normocoiled group. The p value was less than 0.001. Similar results were shown by Gupta et al, Chitra et al and Kashamian et al.[12,14]

APGAR :

In the study group, 30 babies had 1 minute Apgar less than 7. Of these 15 belonged to the normocoiled group, 6 belonged to the hypocoiled group and 9 belonged to the hypercoiled group. This constituted about 24.32% of the babies of the hypercoiled group having low Apgar scores and 17.14%in the hypercoiled group and 6.66%in the normocoiled group. There were 2 babies with 5 minutesApgar less than 7 and both belonged to the hypercoiled group.

Thus both hypocoiling and hypercoiling were associated with low Apgar scores at birth. Similar findings were shown by many authors.

Thus both hypocoiling and hypercoiling are associated with adverse perinatal out comes. Further studies are required to find out the reliability of the coiling index as detected on the ultra sound in the second trimester and its correlation with the coiling index at birth.

SUMMARY

- A total of 300 women who met the inclusion criteria were included in the study.
- Thecoiling index as detected by the ultrasound between 24–28 weeks. The mean coiling index in the study group was 0.38.
- 236 patients belonged to the normocoiled group, 37 patients belonged to hypocoiled group and 37 patients belonged to hypercoiled group.
- They were followed up until delivery and details regarding the gestational age of delivery, mode of delivery, colour of liquor, fetal heart patterns during labour, birth weight and APGAR were noted. The data was analysed.
- Abnormal coiling index was found to be associated with age.< 20 yrs and >30 yrs of age were associated with abnormal coiling index.
- Coiling index was not associated with parity or any other medical disorders in the mother.
- Preterm deliveries, low birth weight babies,abruption, intra uterine death and hypertensive disorders of pregnancy were significantly associated with hypocoiling.

– Meconium stained liquor was significantly associated with hypercoiling.

- GDM in the mother, increased rate of emergency caesarean sections, abnormal fetal heart rate patterns, and increased rate of admission to NICU were associated with both hypocoiling and hypercoiling.

– Thus both hypocoiling and hypercoiling are associated with adverse perinatal outcomes.

CONCLUSION

Abnormal coiling index is known to be associated with adverse perinatal outcomes. Coiling index should become a part of routine antenatal ultrasound. Hence if the coiling index is measured in the antenatal period , it would act as a predictor of adverse perinatal outcome and alert the obstetricians and the paediatricians.

Studies regarding the most appropriate time of measurement of the umbilical cord coiling index that would accurately reflect the perinatal outcome are yet to come. The correlation of the antenatal coiling index with the postnatal coiling and thereby the reliability of the ultrasound are to be studied.

BIBLIOGRAPHY

1. Edmonds HW. The spiral twists of the *normal umbilical cord in twins and in singletons*. Am I obstet Gynecol 1954; 67 : 102 – 20.
2. Rana J, E bert GA, Kappy KA. *Adverse perinatal outcome in patients with abnormal umbilical coiling index*. Obstet Gynecol 1995; 85 : 573– 7.
3. Strong TH, Jarles DL, Vega JS et al. *The umbilical coiling index*. Am I obstet Gynecol 1994; 170 : 29– 32.
4. Lacro RV, Jones KL, Benirschke K. *The umbilical cord twist : origin, direction and relevance*. Am I obstet Gynecol 1987; 157 : 833– 8.
5. Excal T, Lacin S, Fetunyurt s et al. *Umbilical coiling index : Is it a marker for fetus at risk?*Br J clin Pract 1996; 50 : 254– 6.
6. Van Dijk cc, Franx A, De Latt MWM et al. *The umbilical coiling index in normal pregnancy* J matern fetal neonatal med 2002; 11 : 280– 3.
7. Machin GA, Ackerman J, Gilburt – Barness E. *Abnormal umbilical cord coiling is associated & adverse perinatal outcomes*. Pediatr Dev Pathol 2000; 3:462– 71.

8. Degani S, Lei povich Z, Shapiro I, Gonen R, Ohel G. Early second trimester low umbilical coiling index predicts small for gestational age fetuses.

9. Kuita M, Hasegawa J, Miko shiba T, et al. Ultrasound evaluation of the amound of whartons jelly and the umbilical coiling index fetal diagnosis and therapy, 2009; 26 : 85–9.

10. De Laat MW, Franx A, Var Alderen EO *et al. The umbilical coiling index, a review of the literature*. J matern fetal Neonatal Med 2005; 17 : 93–100.

11. Predanic M, Perni S C, Chasen St et al. Ultrasound evaluation of abnormal umbilical cord coiling in second trimester of gestation is associated with adverse pregnancy outcome.

12. T. Chitra, Y.S Sushanth, S Raghavan obstet & Gynecol International 2012.

13. B. D Chaurasia and B.M Agarwal, "*Helical structure of the human umbilical cord*, Acta Anatomica, vol 103, 2 : 226– 230.

14. Shalu Gupta, MMA Faridi, J Krishnan *Umbilical coiling index*. J obstet Gynecol 2006 vol 56, 4 : 315– 319.

15. Morteza Tahmasebi, Raza Alighanbari *evaluation of umbilical cord thickness, cross sectional area and coiling index as predictors of pregnancy outcome.* Indian J Radiol imaging 2011, Jul-sep; 21(3) : 195– 198.

16. Strong Jr. TH ,Elliott JP Radin TG, *non coiled umbilical blood vessel : a new marker for fetus at risk*. Obst &gyne 1993,81(3):409-411.

17. Inderbir Singh , *human embryology*, sixth edition 2000, 38-54.

18. Harvey J.Kliman , *The umbilical cord*, Encyclopaedia of reproduction.

19. Ezhimokai M, Rizk Dee , Thomas L, *Abnormal vascular coiling of the umbilical cord in gestational diabetes mellitus*, Archives of physiology and biochemistry, 2001: 109(3):209-214.

20. Ezhimokai M, Rizk Dee , Thomas L,*Maternal risk factors for abnormal vascular coiling of the umbilical cord*, American Journal of Perinatology, 2000:17(8);441 – 446.

QUESTIONAIRE

NAME : AGE : ID NO.:

ADDRESS :

CONTACT NUMBER :

OBST. SCORE : M/H:

LMP : M/S:

EDD :

GEST. AGE :

GA as per 1st trimester scan:

Medical disorders in the mother:

Hypertension/PIH Epilepsy

Diabetes Mellitus/GDM Thyroid Disturbances

Anaemia Heart Disease

Late Second Trimester Scan:

SLIUG_____ Weeks, _____Presentation

Liquor_____

Coiling Index_____

Clinical Examination:

Pallor: **+** / **-** BP:_____

Ht:____cms Wt:_____kgs

P/A:

P/V:

Delivery Details:

CTG: Reactive / Non-Reactive

Onset of Labour: Spontaneous / Induced

Color of Liquor: Clear / Meconium Stained

Duration of Labour:

Mode of Delivery: Labour Naturale / Operative Vaginal Delivery / LSCS

(indication:_____)

Baby Details:

Sex: M / F

Birth Weight: _____kgs

APGAR: 1 min_____, 5 mins_____

Admission to NICU:

CONSENT FORM

STUDY TITLE: ***" A PROSPECTIVE STUDY ON SONOGRAPHIC EVALUATION OF UMBILICAL COILING INDEX IN LATE SECOND TRIMESTER AND ITS ASSOCIATION WITH PERINATAL OUTCOME AT INSTITUTE OF OBSTETRICS AND GYNAECOLOGY, CHENNAI"***

STUDY CENTRE: Institute Of Obstetrics And Gynaecology, Egmore, Chennai

PARTICIPANT NAME : **AGE:** **SEX :** **ID. NO.**

I confirm that I have understood the purpose of the above study.i have the opportunity to ask the question and all my questions and doubts have been answered to my satisfaction.

I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving any reason.

I understand that the investigator, regulatory authorities and the ethics committee will not need my permission to look at my health records both in respect to the current study and any further research that may be conducted in relation to it , even if I withdraw from the study. I understand that my identity will not be revealed in any information released to third parties of published, unless as required under the law. I agree not to restrict the use of any or results that arise from the study.

I hereby consent to participate in this study titled " ***A PROSPECTIVE STUDY ON SONOGRAPHIC EVALUATION OF UMBILICAL COILING INDEX IN LATE SECOND TRIMESTER AND ITS ASSOCIATION WITH PERINATAL OUTCOME AT INSTITUTE OF OBSTETRICS AND GYNAECOLOGY, CHENNAI***

Signature of InvestigatorPlace:
Date:
Study Investigators Name Institution:

Thanking you,
Yours faithfully,

Signature/thumb impression of patient

s.no	name	age	obst.score	pih	gdm	medi dis	ga at delivery	mode of delivery	ctg	msl	abrup	iud	sex	b wt	apgar	nicu	uci	an uci
1	mrs .R	25	g2p1l1	no	no	no	40w+5d	nvd	N	no	no	no	m	2.5	7/10,8/10	no	n	0.38
2	mrs.M	21	primi	no	no	no	38w4d	nvd	N	no	no	no	m	3	7/10,8/10	no	n	0.38
3	mrs.S	26	Primi	no	no	no	37w5d	nvd	N	yes	no	no	m	2.8	7/10,8/10	no	hyper	0.42
4	mrs.T	20	primi	no	no	no	36w5d	nvd	N	no	no	no	f	2.3	7/10,8/10	no	n	0.36
5	mrs.v	22	g3p1l1a1	no	no	no	39w4d	nvd	AbN	yes	no	no	m	1.8	3/10,5/10	yes	hyper	0.44
6	mrs.j	20	primi	yes	no	no	33w	nvd	AbN	no	yes	no	f	1.3	6/10,7/10	yes	hypo	0.25
7	mrs.l	22	primi	no	no	no	38w2d	nvd	AbN	yes	no	no	m	2.5	7/10,8/10	yes	hyper	0.48
8	mrs.u	26	primi	no	no	hypothyroid	38w4d	emer lscs	AbN	no	no	no	f	3.5	6/10,8/10	no	n	0.4
9	mrs.r	27	primi	no	no	no	38w5d	emer lscs	N	no	no	no	m	2.8	6/10,8/10	no	hyper	0.52
10	mrs.M	27	g2p1l1	no	no	no	38w2d	emer lscs	N	no	no	no	m	3.8	6/10,8/10	no	n	0.38
11	mrs.U	27	primi	no	no	no	40w3d	emer lscs	AbN	yes	no	no	m	2.2	6/10,8/10	no	hyper	0.46
12	mrs.B	24	g2p1l1	no	no	no	36w4d	nvd	N	no	no	no	m	2.3	7/10,8/10	no	n	0.38
13	mrs.S	23	primi	no	no	no	30w6d	nvd	N	no	no	no	f	1.2	6/10,7/10	yes	hypo	0.24
14	mrs.S	34	g3p1l1a1	no	no	no	28w	nvd	-	no	no	no	f	1	6/10,7/10	yes	hypo	0.23
15	mrs.N	29	g2p1l1	no	no	no	38w6d	emer lscs	N	no	no	no	f	3.6	7/10,9/10	no	n	0.39
16	mrs.V	24	primi	no	no	vsd	39w4d	nvd	AbN	yes	no	no	m	2.2	3/10,6/10	yes	hyper	0.47
17	mrs.M	21	g2p1l1	no	no	no	32w2d	nvd	-	no	no	yes	f	1.8	0/10	no	n	0.35
18	mrs.G	27	g2p1l1	no	no	no	39w	emer lscs	N	no	no	no	m	3.3	7/10,8/10	no	n	0.34
19	mrs.D	32	g2p1l1	yes	no	no	39w2d	nvd	N	no	no	no	m	3	7/10,8/10	no	n	0.36
20	mrs.N	24	g2p1l1	no	no	no	39w4d	nvd	N	no	no	no	f	2.2	7/10,8/10	no	n	0.38
21	mrs.V	20	g2p1l1	no	no	no	36w4d	nvd	N	no	no	no	f	2.8	7/10,9/10	no	hypo	0.25
22	mrs.P	22	primi	no	no	no	38w	nvd	N	no	no	no	m	1.9	7/10,8/10	yes	hyper	0.44
23	mrs.A	27	g2a1	no	no	no	39w2d	nvd	N	no	no	no	f	2.5	7/10,8/10	no	n	0.4
24	mrs.S	25	g4p1l1a2	no	no	no	39w2d	nvd	N	no	no	no	f	3.3	8/10,9/10	no	hypo	0.23
25	mrs.L	25	g4p2l2a1	no	no	anaemia	38w4d	nvd	N	no	no	no	m	2.8	7/10,8/10	no	n	0.4
26	mrs.S	17	primi	no	no	no	40w	emer	AbN	yes	no	no	m	2.7	7/10,8/10	no	hyper	0.43

								lscs										
27	mrs.A	31	primi	yes	no	no	37w1d	emer lscs	AbN	no	no	no	m	2.5	7/10,8/10	no	n	0.4
28	mrs.L	23	g3p1l1a1	no	no	anaemia	39w1d	nvd	N	no	no	no	m	2.8	7/10,8/10	no	n	0.39
29	mrs.S	23	primi	no	no	anaemia	39w2d	nvd	N	no	no	no	m	2.4	7/10,9/10	no	n	0.38
30	mrs.P	24	primi	no	no	no	38w	nvd	N	yes	no	no	m	2.6	7/10,9/10	no	hyper	0.49
31	mrs.G	21	primi	no	no	no	40w1d	emer lscs	N	yes	no	no	m	3	7/10,8/10	no	n	0.37
32	mrs.R	24	primi	no	no	no	34w5d	nvd	N	no	no	no	m	2.5	6/10,8/10	yes	n	0.36
33	mrs.S	21	primi	no	no	no	39w6d	nvd	N	no	no	no	m	2.5	7/10,8/10	no	n	0.35
34	mrs.S	22	g2p1l1	no	no	no	39w6d	emer lscs	N	no	no	no	m	4.3	7/10,8/10	no	hypo	0.21
35	mrs.K	22	g2p1l1	no	no	no	36w2d	nvd	N	no	no	no	m	2.4	7/10,8/10	no	n	0.35
36	mrs.N	21	primi	no	no	no	38w3d	emer lscs	N	no	no	no	f	3	7/10,8/10	no	hypo	0.18
37	mrs.M	25	g2p1l1	no	no	no	37w	nvd	N	no	no	no	m	2.8	7/10,8/10	no	n	0.36
38	mrs.J	23	g2a1	no	no	no	37w6d	nvd	N	no	no	no	m	2.3	7/10,8/10	no	n	0.37
39	mrs.R	26	g2p1l1	no	no	no	40w	nvd	N	yes	no	no	m	2.5	7/10,8/10	no	n	0.38
40	mrs.N	22	primi	no	no	no	36w5d	nvd	N	no	no	no	f	2.8	7/10,8/10	no	n	0.39

s.no	name	age	obst.score	pih	gdm	medi dis	ga at delivery	mode of delivery	ctg	msl	abrup	iud	sex	b wt	apgar	nicu	uci	an uci
41	mrs.S	27	primi	no	no	no	39w4d	nvd	N	no	no	no	f	2.9	7/10,8/10	no	n	0.4
42	mrs.T	22	primi	no	no	no	37w	nvd	N	no	no	no	m	3	7/10,8/10	no	n	0.4
43	mrs.P	21	g2p1l1	no	yes	no	37w5d	nvd	N	no	no	no	m	3.2	7/10,8/10	yes	n	0.39
44	mrs.B	28	g3p1l1a1	no	no	hypothyroid	38w4d	nvd	N	no	no	no	m	2.8	7/10,8/10	no	n	0.4
45	mrs.D	32	g2p1l1	no	yes	no	38w	nvd	AbN	no	no	no	m	3.2	7/10,8/10	yes	hyper	0.39
46	mrs.V	27	primi	yes	no	no	37w6d	emer lscs	AbN	yes	no	no	m	2.6	6/10,7/10	no	n	0.38
47	mrs.R	30	g2p1l1	no	no	epileptic	40w	nvd	N	no	no	no	f	3.4	8/10,9/10	no	n	0.4
48	mrs.S	24	primi	no	no	no	39w5d	nvd	N	no	no	no	f	2.9	7/10,9/10	no	n	0.37
49	mrs.F	26	g2a1	no	no	no	38w5d	nvd	N	no	no	no	f	3.3	7/10,8/10	no	n	0.36
50	mrs.C	33	primi	yes	no	no	39w3d	emer lscs	AbN	no	no	no	f	3.1	7/10,9/10	no	hypo	0.12
51	mrs.G	19	primi	no	no	no	34w1d	nvd	N	no	no	no	f	2.1	6/10,7/10	no	hypo	0.15
52	mrs.H	25	primi	no	no	no	38w	nvd	N	no	no	no	f	2.8	7/10,8/10	no	n	0.38
53	mrs.T	22	primi	no	no	no	40w2d	emer lscs	N	no	no	no	m	2.7	8/10,9/10	no	n	0.39
54	mrs.U	29	primi	no	no	anaemia	39w4d	nvd	N	no	no	no	m	3.4	7/10,8/10	no	n	0.4
55	mrs.S	25	g2p1l1	no	no	no	38w1d	nvd	N	yes	no	no	m	3.2	7/10,8/10	no	n	0.38
56	mrs.P	24	primi	no	no	no	39w4d	nvd	N	no	no	no	f	3.1	7/10,9/10	no	n	0.4
57	mrs.M	28	primi	no	no	no	37w	nvd	N	no	no	no	f	2.4	7/10,8/10	no	n	0.4
58	mrs.N	31	primi	no	no	no	35w3d	nvd	_	no	no	yes	f	2.2	0/10	no	hypo	0.3
59	mrs.I	27	primi	yes	no	no	39w4d	nvd	N	no	no	no	f	3	7/10,9/10	no	n	0.36
60	mrs.B	23	primi	no	no	no	38w5d	nvd	N	no	no	no	m	2.5	7/10,8/10	no	n	0.38
61	mrs.S	34	g2p1l1	no	yes	no	38w	nvd	N	no	no	no	f	3.4	7/10,8/10	no	n	0.36
62	mrs.V	32	primi	no	no	no	39w2d	emer lscs	N	no	no	no	f	3.1	7/10,8/10	no	n	0.38
63	mrs.N	24	g2a1	no	no	anaemia	40w2d	nvd	N	no	no	no	m	2.7	7/10,8/10	no	n	0.4

64	mrs.G	21	primi	no	no	no	38w3d	nvd	N	no	no	no	m	2.4	7/10,8/10	no	n	0.38
65	mrs.D	25	g3p1l1a1	no	no	no	39w3d	nvd	N	no	no	no	f	2.8	7/10,8/10	no	n	0.36
66	mrs.R	23	g4p1l1a2	no	yes	no	37w2d	nvd	N	no	no	no	m	3	7/10,8/10	no	n	0.37
67	mrs.F	27	primi	no	no	no	39w2d	nvd	N	no	no	no	f	2.8	8/10,9/10	no	n	0.38
68	mrs.Y	34	primi	no	no	no	39w1d	emer lscs	non reactive	yes	no	no	f	3.1	6/10,8/10	yes	n	0.4
69	mrs.R	21	g2a1	no	no	asd	37w6d	nvd	N	no	no	no	m	2.7	8/10,9/10	no	n	0.4
70	mrs.A	17	primi	no	no	no	40w3d	emer lscs	N	no	no	no	m	2.9	7/10,9/10	no	n	0.38
71	mrs.T	37	primi	yes	no	hypothyroid	38w4d	emer lscs	N	no	no	no	f	2.7	7/10,9/10	no	n	0.39
72	mrs.U	21	g2p1l1	no	no	no	39w1d	nvd	N	no	no	no	m	2.5	7/10,8/10	no	n	0.38
73	mrs.p	24	g2p1l1	no	no	no	40w4d	nvd	N	no	no	no	f	2.8	8/10,9/10	no	n	0.39
74	mrs.g	27	primi	no	no	no	39w3d	nvd	N	no	no	no	m	3	8/10,9/10	no	n	0.37
75	mrs.E	29	primi	no	no	no	39w4d	nvd	N	no	no	no	f	3.2	8/10,9/10	no	n	0.38
76	mrs.b	30	g3p1l1a1	no	no	epileptic	38w3d	nvd	N	no	no	no	m	3.1	7/10,9/10	no	n	0.4
77	mrs.S	22	primi	no	no	no	38w5d	emer lscs	N	yes	no	no	f	2.5	7/10,9/10	no	n	0.4
78	mrs.k	24	primi	no	no	no	40w	emer lscs	AbN	no	no	no	f	2.8	8/10,9/10	no	n	0.39
79	mrs.k	28	primi	no	no	no	39w4d	nvd	N	no	no	no	m	2.4	8/10,9/10	no	n	0.38
80	mrs.r	26	g3p2l2	no	no	no	38w3d	nvd	N	no	no	no	m	2.9	7/10,9/10	no	n	0.4

s.no	name	age	obst.score	pih	gdm	medi dis	ga at delivery	mode of delivery	ctg	msl	abrup	iud	sex	b wt	apgar	nicu	uci	an uci
81	mrs.o	17	primi	yes	no	anaemia	37w4d	emer lscs	N	no	no	no	m	1.8	6/10,8/10	no	n	0.4
82	mrs.p	20	primi	no	no	no	34w2d	nvd	N	no	no	no	f	2	7/10,8/10	yes	hypo	0.19
83	mrs.h	23	g3a2	no	no	no	39w3d	emer lscs	AbN	no	no	no	f	2.8	7/10,9/10	no	n	0.39
84	mrs.c	25	g2p1l1	no	no	no	38w1d	nvd	N	no	no	no	f	2.6	8/10,9/10	no	n	0.38
85	mrs.l	27	primi	no	no	no	40w4d	nvd	N	yes	no	no	m	3	8/10,9/10	no	n	0.39
86	mrs.a	29	primi	no	no	no	36w5d	nvd	N	no	no	no	m	2.7	7/10,8/10	no	n	0.38
87	mrs.s	31	g3p1l1a1	no	yes	no	38w6d	nvd	N	no	no	no	f	3.1	8/10,9/10	no	n	0.37
88	mrs.d	19	primi	no	no	no	38w5d	emer lscs	N	no	no	no	f	3.2	7/10,9/10	no	n	0.39
89	mrs.f	24	primi	no	no	no	39w6d	nvd	N	no	no	no	m	2.9	8/10,9/10	no	n	0.4
90	mrs.g	22	primi	no	no	anaemia	40w	nvd	N	no	no	no	m	2.7	7/10,8/10	no	n	0.4
91	mrs.h	18	primi	no	no	hypothyroid	40w	emer lscs	N	no	no	no	f	2.6	8/10,9/10	no	n	0.39
92	mrs.j	20	primi	no	no	no	40w2d	nvd	N	no	no	no	f	2.8	8/10,9/10	no	n	0.4
93	mrs.k	22	g2p1l1	no	no	no	39w4d	nvd	N	yes	no	no	m	2.9	7/10,8/10	no	n	0.4
94	mrs.l	24	g2a1	no	no	no	38w1d	nvd	N	no	no	no	m	3.1	8/10,9/10	no	n	0.38
95	mrs.e	26	primi	yes	no	no	38w2d	emer lscs	N	no	no	no	m	2.4	7/10,9/10	no	n	0.4
96	mrs.r	28	g3p1l1a1	no	no	no	37w4d	nvd	N	no	no	no	m	2.7	7/10,8/10	no	n	0.41
97	mrs.t	30	primi	no	yes	chr.ht	37w4d	emer lscs	AbN	yes	no	no	m	3.1	6/10,8/10	yes	hyper	0.58
98	mrs.y	28	primi	no	no	anaemia	39w5d	nvd	N	no	no	no	m	2.7	7/10,8/10	no	n	0.4
99	mrs.u	25	g2p1l1	no	no	no	40w3d	nvd	N	no	no	no	m	2.7	8/10,9/10	no	n	0.39
100	mrs.i	21	primi	no	no	no	39w6d	nvd	N	no	no	no	m	2.9	7/10,9/10	no	n	0.38
101	mrs.o	31	g2p1l1	no	no	chr.ht	38w	emer lscs	AbN	yes	no	no	m	2.5	7/10,8/10	yes	hyper	0.72
102	mrs.p	22	primi	yes	no	no	34w6d	nvd	N	no	no	no	f	2.1	7/10,8/10	yes	hypo	0.18
103	mrs.z	25	g2a1	no	no	no	39w1d	nvd	N	no	no	no	f	2.9	8/10,9/10	no	n	0.36
104	mrs.c	24	primi	no	no	no	38w5d	nvd	N	no	no	no	f	2.7	7/10,8/10	no	n	0.38
105	mrs.v	26	primi	no	no	no	40w4d	emer lscs	N	no	no	no	f	2.8	8/10,9/10	no	n	0.39

106	mrs.b	18	primi	yes	no	anaemia	37w6d	emer lscs	N	no	no	no	f	3.2	7/10,8/10	no	n	0.4
107	mrs.n	28	g3p2l2	no	yes	no	38w5d	nvd	N	yes	no	no	f	3	7/10,8/10	no	n	0.4
108	mrs.m	25	primi	no	no	no	32w1d	nvd	N	no	no	no	f	1.8	6/10,7/10	yes	n	0.41
109	mrs.t	22	primi	no	no	no	39w4d	emer lscs	N	no	no	no	f	2.5	7/10,9/10	no	n	0.4
110	mrs.s	23	g2p1l1	no	no	no	40w3d	nvd	N	no	no	no	m	3.1	8/10,9/10	no	n	0.39
111	mrs.l	21	primi	no	no	anaemia	38w5d	emer lscs	AbN	no	no	no	m	2.3	7/10,8/10	no	hyper	0.63
112	mrs.m	29	g4p1p1a2	no	yes	no	38w	nvd	N	no	no	no	m	2.5	8/10,9/10	no	n	0.38
113	mrs.m	22	primi	no	no	no	37w5d	nvd	N	no	no	no	m	2.7	7/10,8/10	no	n	0.37
114	mrs.d	28	g2p1l1	no	no	no	38w4d	nvd	N	no	no	no	m	2.9	8/10,9/10	no	n	0.38
115	mrs.p	23	primi	no	no	no	39w5d	nvd	N	no	no	no	f	3	7/10,9/10	no	n	0.39
116	mrs.t	27	primi	no	no	anaemia	39w3d	emer lscs	AbN	no	no	no	f	2.8	8/10,9/10	no	n	0.39
117	mrs.g	24	primi	no	no	no	38w6d	nvd	N	no	no	no	f	3.2	7/10,8/10	no	n	0.37
118	mrs.a	26	g2p1l1	no	no	no	35w4d	nvd	N	no	no	no	f	2.2	6/10,8/10	yes	hypo	0.22
119	mrs.a	25	g2a1	no	no	no	39w4d	nvd	N	no	no	no	f	2.9	6/10,8/10	no	n	0.38
120	mrs.a	33	primi	no	no	chr.ht	38w1d	emer lscs	N	no	no	no	m	2.8	7/10,9/10	no	n	0.37
s.no	name	age	obst.score	pih	gdm	medi dis	ga at delivery	mode of delivery	ctg	msl	abrup	iud	sex	b wt	apgar	nicu	uci	an uci
121	mrs.l	19	primi	no	no	no	37w4d	emer lscs	N	yes	no	no	m	2.4	5/10,7/10	yes	hyper	0.54
122	mrs.s	20	primi	no	no	hypothyroid	39w4d	nvd	N	no	no	no	f	2.8	7/10,8/10	no	n	0.4
123	mrs.s	26	g2p1l1	no	no	no	40w4d	emer lscs	AbN	no	no	no	m	3.4	7/10,8/10	no	n	0.4
124	mrs.r	25	g3p1l1a1	no	yes	no	37w5d	nvd	N	no	no	no	f	3.2	7/10,9/10	no	n	0.4
125	mrs.d	21	g2p1l1	no	no	no	38w5d	emer lscs	N	no	no	no	m	2.9	7/10,8/10	no	hyper	0.62
126	mrs.p	22	primi	no	no	anaemia	39w4d	nvd	N	no	no	no	f	2.8	8/10,9/10	no	n	0.4
127	mrs.c	24	primi	no	no	no	35w4d	nvd	N	no	no	no	f	2.2	7/10,8/10	yes	hypo	0.21
128	mrs.h	22	primi	no	no	epileptic	38w5d	nvd	N	no	no	no	m	3.1	8/10,9/10	no	n	0.4
129	mrs.j	25	primi	no	no	no	40w1d	nvd	N	no	no	no	m	3	7/10,8/10	no	n	0.39
130	mrs.a	21	g2a1	no	no	no	39w2d	emer lscs	AbN	yes	no	no	m	3.2	5/10,8/10	yes	n	0.38

131	mrs.g	22	primi	no	no	no	34w2d	nvd	N	no	no	no	f	2.4	7/10,8/10	no	hypo	0.26
132	mrs.l	24	g2p1l1	no	no	no	40w	nvd	N	no	no	no	f	2.8	7/10,8/10	no	n	0.36
133	mrs.o	26	g3p1l1a1	no	no	no	39w4d	nvd	N	no	no	no	f	2.9	7/10,8/10	no	n	0.37
134	mrs.s	28	g2p1l1	no	no	no	40w2d	nvd	N	no	no	no	m	3.2	8/10,9/10	no	hyper	0.58
135	mrs.s	18	primi	no	no	anaemia	39w4d	emer lscs	AbN	no	no	no	m	2.9	7/10,8/10	no	n	0.38
136	mrs.a	19	primi	yes	no	no	38w4d	emer lscs	N	yes	no	no	m	2.8	7/10,8/10	yes	n	0.39
137	mrs.p	31	primi	no	yes	no	38w2d	emer lscs	N	yes	no	no	m	3.8	6/10,8/10	yes	hyper	0.78
138	mrs.t	29	g3p2l2	no	no	no	39w5d	nvd	N	no	no	no	m	3.2	7/10,8/10	no	n	0.39
139	mrs.h	27	primi	no	no	anaemia	39w2d	nvd	N	no	no	no	m	3	7/10,8/10	no	n	0.38
140	mrs.j	26	g3p1l1a1	no	no	no	40w3d	nvd	N	no	no	no	f	3.1	7/10,8/10	no	n	0.39
141	mrs.h	23	g2p1l1	no	no	asd	39w5d	nvd	N	no	no	no	f	2.7	8/10,9/10	no	n	0.4
142	mrs.p	21	primi	no	no	no	39w4d	nvd	N	no	no	no	f	2.9	8/10,9/10	no	n	0.41
143	mrs.g	22	g2p1l1	no	no	no	40w3d	emer lscs	N	no	no	no	f	2.9	7/10,8/10	no	n	0.39
144	mrs.b	19	primi	yes	no	no	35w4d	emer lscs	-	no	yes	yes	f	1.8	0/10	no	hypo	0.28
145	mrs.c	36	g3a2	no	no	chr.ht	38w1d	emer lscs	N	no	no	no	m	3.2	7/10,8/10	no	n	0.4
146	mrs.v	32	g2a1	no	yes	no	38w3d	emer lscs	N	no	no	no	m	2.9	7/10,8/10	no	n	0.4
147	mrs.a	17	primi	no	no	anaemia	39w	emer lscs	AbN	no	no	no	m	2.4	7/10,8/10	no	hyper	0.46
148	mrs.l	21	primi	no	no	no	40w1d	nvd	N	no	no	no	m	2.9	8/10,9/10	no	n	0.4
149	mrs.h	22	primi	no	no	no	38w4d	nvd	N	no	no	no	m	3	7/10,8/10	no	n	0.4
150	mrs.c	27	g2p1l1	no	no	no	39w2d	nvd	N	no	no	no	m	2.4	7/10,8/10	no	n	0.39
151	mrs.t	23	primi	no	no	anaemia	38w4d	emer lscs	N	no	no	no	m	2.8	8/10,9/10	no	hyper	0.49
152	mrs.d	21	primi	no	no	no	38w4d	emer lscs	N	yes	no	no	f	2.9	7/10,8/10	no	n	0.4
153	mrs.v	24	primi	no	no	no	39w5d	nvd	N	no	no	no	f	3.2	8/10,9/10	no	n	0.38
154	mrs.k	31	g2p1l1	no	yes	hypothyroid	38w3d	nvd	N	no	no	no	f	3.6	7/10,8/10	no	n	0.38
155	mrs.k	19	primi	yes	no	no	38w	emer lscs	AbN	yes	no	no	f	2.9	7/10,8/10	no	hypo	0.31

s.no	name	age	obst.score	pih	gdm	medi dis	ga at delivery	mode of delivery	ctg	msl	abrup	iud	sex	b wt	apgar	nicu	uci	an uci
156	mrs.a	26	g3p1l1a1	no	no	no	39w4d	nvd	N	no	no	no	f	3.1	8/10,9/10	no	n	0.38
157	mrs.d	25	g2a1	no	no	no	40w2d	emer lscs	AbN	no	no	no	f	2.8	7/10,8/10	no	n	0.4
158	mrs.a	27	g3p2l2	no	no	anaemia	39w4d	nvd	N	no	no	no	m	2.9	7/10,8/10	no	n	0.4
159	mrs.v	19	primi	no	no	no	38w5d	emer lscs	N	no	no	no	m	2.8	8/10,9/10	no	n	0.4
160	mrs.g	26	g5p1l1a3	no	no	no	40w2d	emer lscs	N	no	no	no	m	3	7/10,8/10	no	n	0.38
161	mrs.g	34	primi	yes	no	type2 dm	38w1d	emer lscs	AbN	no	no	no	f	3.4	7/10,8/10	yes	hyper	0.48
162	mrs.p	30	g2p1l1	no	no	no	36w2d	nvd	N	no	no	no	m	2.8	7/10,8/10	yes	hypo	0.33
163	mrs.a	24	primi	no	no	anaemia	39w1d	nvd	N	no	no	no	f	3.4	5/10,8/10	no	n	0.36
164	mra.k	26	g2p1l1	no	no	no	38w5d	nvd	N	no	no	no	f	2.8	8/10,9/10	no	n	0.38
165	mrs.k	23	g3p1l1a1	no	no	no	31w4d	nvd	N	no	no	no	f	1.4	6/10,7/10	yes	n	0.36
166	mrs.f	21	primi	no	no	anaemia	39w3d	emer lscs	N	no	no	no	m	2.7	7/10,8/10	no	n	0.38
167	mrs.s	22	primi	no	no	no	38w2d	emer lscs	N	yes	no	no	f	2.9	7/10,8/10	no	hyper	0.49
168	mrs.r	27	g3a2	no	yes	no	38w1d	emer lscs	N	no	no	no	f	2.9	8/10,9/10	no	n	0.4
169	mrs.r	23	g2p1l1	no	no	no	39w5d	nvd	N	no	no	no	m	2.7	7/10,8/10	no	n	0.4
170	mrs.l	24	primi	no	no	no	38w5d	nvd	N	no	no	no	m	3	8/10,9/10	no	n	0.38
171	mrs.b	21	primi	no	no	anaemia	39w4d	emer lscs	AbN	no	no	no	m	2.7	7/10,8/10	no	n	0.36
172	mrs.l	23	g2p1l1	yes	no	no	37w1d	nvd	N	no	no	no	m	2.9	7/10,8/10	no	hypo	0.23
173	mrs.d	25	g2a1	no	no	anaemia	39w4d	nvd	N	no	no	no	m	2.9	8/10,9/10	no	n	0.38
174	mrs.i	27	g3p1l1a1	no	no	no	40w	nvd	N	no	no	no	f	3.2	7/10,9/10	no	n	0.38
175	mrs.a	29	g4a3	no	no	no	39w2d	emer lscs	N	no	no	no	f	2.9	7/10,8/10	no	n	0.4
176	mrs.a	31	primi	no	yes	no	38w3d	emer lscs	AbN	yes	no	no	f	3	7/10,8/10	yes	hyper	0.54
177	mrs.e	19	primi	yes	no	anaemia	38w1d	nvd	N	no	no	no	f	2.7	8/10,9/10	no	n	0.4
178	mrs.v	34	g2p1l1	no	no	type2 dm	38w2d	emer lscs	N	no	no	no	f	3.1	7/10,9/10	no	n	0.4
179	mrs.l	20	primi	no	no	no	36w2d	nvd	N	no	no	no	m	2.7	7/10.8/10	no	n	0.38
180	mrs.a	22	primi	no	no	no	40w4d	nvd	N	no	no	no	m	2.5	7/10,8/10	no	n	0.37
181	mrs.k	21	primi	no	no	anaemia	40w2d	nvd	N	no	no	no	m	3	8/10,9/10	no	n	0.39
182	mrs.r	24	primi	no	no	no	35w3d	nvd	N	no	no	no	f	2.4	7/10,8/10	yes	hyper	0.58

3	mrs.l	24	primi	no	no	no	38w2d	emer lscs	N	no	no	no	f	3.2	8/10,9/10	no	n	0.39
184	mrs.a	26	g3p1l1a1	no	no	no	40w3d	nvd	N	yes	no	no	f	3	7/10,8/10	no	n	0.38
185	mrs.t	28	g3p2l2	no	no	anaemia	39w4d	nvd	N	no	no	no	f	3.2	8/10,9/10	no	n	0.38
186	mrs.l	31	g2p1l1	yes	no	no	39w	nvd	N	yes	no	no	m	3	7/10,8/10	no	hypo	0.29
187	mrs.a	20	primi	no	no	no	40w3d	emer lscs	AbN	no	no	no	m	2.8	8/10,9/10	no	n	0.4
188	mrs.s	19	primi	no	no	anaemia	39w4d	emer lscs	N	no	no	no	m	2.9	7/10,8/10	no	n	0.4
189	mrs.s	24	g2p1l1	no	no	no	38w4d	nvd	N	no	no	no	m	3.1	7/10,8/10	no	n	0.38
190	mrs.r	28	primi	no	yes	no	38w4d	emer lscs	AbN	no	no	no	m	3.5	7/10,8/10	no	hypo	0.28

s.no	name	age	obst.score	pih	gdm	medi dis	ga at delivery	mode of delivery	ctg	msl	abrup	iud	sex	b wt	apgar	nicu	uci	an uci
191	mrs.t	19	primi	yes	no	no	38w	emer lscs	N	yes	no	no	f	3	7/10,8/10	no	hyper	0.62
192	mrs.p	20	g2p1l1	no	no	epileptic	39w4d	nvd	N	no	no	no	m	2.8	7/10,8/10	no	n	0.39
193	mrs.u	23	g3p1l1a1	no	no	vsd	39w5d	nvd	N	no	no	no	f	2.7	8/10,9/10	no	n	0.4
194	mrs.h	25	primi	no	no	no	38w1d	nvd	N	no	no	no	f	2.9	8/10,9/10	no	n	0.39
195	mrs.g	27	g3a2	no	yes	anaemia	38w1d	emer lscs	AbN	no	no	no	m	2.7	8/10,9/10	yes	hypo	0.26
196	mrs.j	29	g2p1l1	no	no	no	40w3d	nvd	N	no	no	no	f	3.1	7/10,8/10	no	n	0.39
197	mrs.r	25	g2p1l1	no	no	no	40w2d	nvd	N	no	no	no	f	3.2	8/10,9/10	no	n	0.4
198	mrs.b	26	primi	no	no	no	39w4d	nvd	N	no	no	no	m	2.7	7/10,8/10	no	n	0.4
199	mrs.v	21	primi	yes	no	no	38w4d	emer lscs	N	yes	no	no	m	2.9	7/10,8/10	no	hypo	0.2
200	mrs.c	22	primi	no	no	anaemia	38w5d	emer lscs	AbN	no	no	no	m	3	7/10,8/10	no	n	0.38
201	mrs.v	21	primi	no	no	no	38w2d	emer lscs	AbN	yes	no	no	f	3.2	7/10,8/10	yes	hyper	0.56
202	mrs.a	23	g2p1l1	no	no	anaemia	34w5d	nvd	N	no	no	no	m	2.4	7/10,8/10	yes	hypo	0.22
203	mrs.l	24	primi	no	no	no	40w4d	nvd	N	no	no	no	m	2.9	7/10,8/10	no	n	0.36
204	mrs.p	22	g3p1l1a1	no	no	no	39w5d	nvd	N	no	no	no	m	3.3	7/10,8/10	no	n	0.38
205	mrs.r	23	primi	yes	no	no	39w4d	emer lscs	AbN	no	no	no	f	2.9	7/10,8/10	no	n	0.36
206	mrs.a	19	primi	no	no	anaemia	38w5d	nvd	N	no	no	no	f	3	7/10,8/10	no	n	0.4
207	mrs.v	28	g2p1l1	no	yes	no	38w4d	nvd	N	yes	no	no	f	2.7	8/10,9/10	no	n	0.4
208	mrs.r	26	g2a1	no	no	no	39w5d	emer lscs	N	no	no	no	f	3.2	7/10,8/10	no	n	0.41
209	mrs.l	20	g2p1l1	no	no	no	40w4d	nvd	N	no	no	no	m	3.1	8/10,9/10	no	n	0.39
210	mrs.h	31	primi	yes	no	no	37w2d	emer lscs	N	no	no	no	m	1.8	6/10,8/10	yes	hypo	0.28
211	mrs.g	19	primi	no	no	anaemia	39w5d	emer lscs	N	yes	no	no	f	3.1	7/10,8/10	no	n	0.38
212	mrs.k	29	g2p1l1	no	no	no	40w3d	nvd	N	no	no	no	m	2.8	8/10,9/10	no	n	0.37
213	mrs.g	26	primi	no	no	no	39w5d	nvd	N	no	no	no	f	3.2	8/10,9/10	no	n	0.38
214	mrs.a	34	g3p1l1a1	yes	no	no	38w4d	nvd	AbN	yes	no	no	f	3	7/10,8/10	no	hyper	0.58
215	mrs.p	26	primi	no	no	no	39w2d	emer	N	no	no	no	m	2.7	7/10,8/10	no	n	0.39

								lscs										
216	mrs.l	28	primi	no	no	no	35w4d	nvd	N	no	no	no	f	2.6	8/10,9/10	yes	n	0.38
217	mrs.a	25	g2p1l1	no	no	anaemia	38w6d	nvd	N	no	no	no	m	2.9	7/10,8/10	no	n	0.38
218	mrs.s	24	g2a1	no	no	no	39w5d	nvd	N	yes	no	no	f	2.8	7/10,8/10	no	n	0.4
219	mrs.s	20	primi	no	no	no	37w4d	emer lscs	N	no	no	no	f	2.7	7/10,8/10	no	n	0.4
220	mrs.r	33	g3p2l2	no	yes	anaemia	38w3d	emer lscs	AbN	no	no	no	m	3.4	7/10,8/10	yes	hypo	0.26
221	mrs.t	29	g4p1l1a2	no	no	no	38w2d	nvd	N	no	no	no	m	3.2	8/10,9/10	no	n	0.38
222	mrs.k	28	primi	no	no	no	39w2d	nvd	N	no	no	no	f	2.7	7/10,8/10	no	n	0.39
223	mrs.l	27	primi	no	no	hypothyroid	39w4d	nvd	N	yes	no	no	f	3	7/10,8/10	no	hyper	0.56
224	mrs.d	29	g2p1l1	yes	no	no	34w1d	nvd	N	no	no	no	m	2.2	7/10,8/10	yes	hypo	0.3
225	mrs.h	24	g3a2	no	no	no	38w5d	nvd	N	no	no	no	m	2.9	7/10,8/10	no	n	0.4
s.no	**name**	**age**	**obst.score**	**pih**	**gdm**	**medi dis**	**ga at delivery**	**mode of delivery**	**ctg**	**msl**	**abrup**	**iud**	**sex**	**b wt**	**apgar**	**nicu**	**uci**	**an uci**
226	mrs.g	18	primi	no	no	anaemia	38w4d	emer lscs	AbN	no	no	no	f	2.8	7/10,8/10	no	hyper	0.6
227	mrs.f	19	primi	no	no	anaemia	39w3d	emer lscs	N	no	no	no	m	2.7	5/10,7/10	no	n	0.4
228	mrs.p	21	primi	no	no	no	37w2d	nvd	N	no	no	no	f	2.8	8/10,9/10	no	n	0.39
229	mrs.k	35	g2p1l1	yes	yes	no	38w	emer lscs	N	no	no	no	f	3.5	7/10,8/10	no	n	0.4
230	mrs.j	30	g3p1l1a1	no	no	no	38w4d	emer lscs	AbN	yes	no	no	m	3.1	6/10,8/10	yes	n	0.39
231	mrs.t	21	primi	no	no	no	39w4d	emer lscs	N	yes	no	no	f	2.8	7/10,8/10	no	n	0.38
232	mrs.r	23	g2p1l1	no	no	no	38w2d	nvd	N	no	no	no	m	3.1	7/10,8/10	no	n	0.36
233	mrs.a	25	g2p1l1	yes	yes	anaemia	37w5d	emer lscs	N	no	no	no	m	1.7	6/10,8/10	yes	hypo	0.18
234	mrs.e	24	g2a1	no	no	no	40w1d	nvd	AbN	no	no	no	m	3	8/10,9/10	no	n	0.37
235	mrs.l	22	g2p1l0	no	no	no	38w4d	nvd	N	no	no	no	f	2.9	7/10,8/10	no	n	0.4
236	mrs.a	18	primi	yes	no	epileptic	38w4d	emer lscs	N	yes	no	no	f	2.5	7/10,8/10	no	hyper	0.4
237	mrs.r	28	primi	no	no	hypothyroid	34w2d	nvd	N	no	no	no	m	1.6	6/10,8/10	yes	n	0.4
238	mrs.s	29	g3p1l1a1	no	no	no	39w6d	nvd	N	no	no	no	f	2.7	8/10,9/10	no	n	0.38
239	mrs.c	28	primi	yes	no	no	38w5d	emer	AbN	yes	no	no	m	2.9	7/10,8/10	no	hypo	0.39

								lscs										
240	mrs.b	26	primi	no	no	no	40w3d	nvd	N	no	no	no	f	3.2	8/10,9/10	no	n	0.38
241	mrs.v	22	g3p2l1	no	no	no	36w3d	nvd	N	no	no	no	f	2.9	7/10,8/10	no	hyper	0.54
242	mrs.n	24	primi	no	no	anaemia	38w4d	emer lscs	N	no	no	no	m	2.9	8/10,9/10	no	n	0.4
243	mrs.m	23	primi	no	no	anaemia	39w4d	nvd	N	yes	no	no	f	3	7/10,8/10	no	hyper	0.56
244	mrs.m	25	g3p1l1a1	no	no	no	39w2d	nvd	N	no	no	no	m	3.2	8/10,9/10	no	n	0.4
245	mrs.k	27	g2p1l1	yes	no	no	40w4d	nvd	N	no	no	no	f	3.4	7/10,8/10	no	n	0.38
246	mrs.l	22	primi	no	no	no	34w2d	nvd	N	no	no	no	f	2	7/10,8/10	yes	n	0.39
247	mrs.s	21	g2p1l0	no	no	no	40w	nvd	N	no	no	no	m	2.8	8/10,9/10	no	n	0.38
248	mrs.n	18	primi	yes	no	no	38w1d	emer lscs	N	no	no	no	m	2.6	7/10,8/10	no	hypo	0.24
249	mrs.r	30	g2a1	no	yes	chr.ht	38w	emer lscs	AbN	no	no	no	m	3	7/10,8/10	no	n	0.39
250	mrs.p	32	primi	no	no	no	40w4d	emer lscs	AbN	yes	no	no	m	3.2	6/10,8/10	yes	n	0.38
251	mrs.d	24	g2p1l1	no	no	vsd	39w4d	nvd	N	no	no	no	f	2.9	8/10,9/10	no	n	0.37
252	mrs.a	22	primi	no	no	no	40w3d	emer lscs	N	yes	no	no	f	3.1	7/10,8/10	no	n	0.39
253	mrs.k	21	g2a1	no	no	anaemia	38w4d	emer lscs	N	no	no	no	m	2.6	7/10,8/10	no	n	0.4
254	mrs.j	25	g3p1l1a1	no	no	no	39w2d	nvd	N	no	no	no	m	2.7	7/10,9/10	no	n	0.4
255	mrs.h	27	primi	no	no	anaemia	35w2d	nvd	N	no	no	no	f	2	7/10,8/10	yes	hyper	0.58
256	mrs.r	29	g4p1l1a2	no	no	no	40w2d	nvd	N	no	no	no	f	3	8/10,9/10	no	n	0.41
257	mrs.n	34	primi	no	yes	no	38w4d	emer lscs	AbN	no	no	no	m	3.4	7/10,8/10	no	hypo	0.22
258	mrs.k	17	primi	yes	no	no	38w3d	nvd	N	no	no	no	m	2.8	7/10,8/10	no	n	0.4
259	mrs.d	27	g2p1l1	yes	no	no	37w6d	nvd	N	no	no	no	f	2.9	7/10,8/10	no	n	0.4
260	mrs.p	25	primi	no	no	anaemia	39w3d	emer lscs	AbN	no	no	no	f	3.1	7/10,8/10	no	n	0.38

s.no	name	age	obst.score	pih	gdm	medi dis	ga at delivery	mode of delivery	ctg	msl	abrup	iud	sex	b wt	apgar	nicu	uci	an uci
261	mrs.g	24	primi	no	no	no	38w4d	emer lscs	N	no	no	no	m	2.8	7/10,8/10	no	n	0.36
262	mrs.m	27	g2p1l1	no	no	no	40w2d	nvd	N	yes	no	no	m	3	8/10,9/10	no	n	0.39
263	mrs.h	33	g3p1l1a1	no	yes	no	38w4d	nvd	N	no	no	no	f	3.4	7/10,8/10	no	hyper	0.55
264	mrs.a	21	g2a1	no	no	no	35w2d	nvd	N	no	no	no	f	2.1	7/10,8/10	yes	n	0.39
265	mrs.h	19	primi	yes	no	no	38w3d	emer lscs	AbN	no	no	no	m	2.8	7/10,8/10	no	hypo	0.3
266	mrs.a	28	g2p1l1	s	no	no	40w4d	nvd	N	no	no	no	f	2.7	7/10,8/10	no	n	0.4
267	mrs.p	29	g3p2l1	no	no	no	39w	nvd	N	no	no	no	m	3.7	8/10,9/10	no	n	0.4
268	mrs.v	31	primi	no	no	no	38w4d	emer lscs	N	no	no	no	m	2.9	7/10,9/10	no	n	0.38
269	mrs.z	19	primi	yes	no	anaemia	37w4d	emer lscs	N	no	no	no	m	2.9	7/10,9/10	no	hypo	0.3
270	mrs.h	25	primi	no	no	no	38w4d	nvd	N	no	no	no	f	2.8	7/10,8/10	no	n	0.36
271	mrs.s	24	primi	no	no	no	37w5d	emer lscs	AbN	yes	no	no	f	2.9	5/10.7/10	yes	hyper	0.62
272	mrs.r	25	g2p1l1	no	no	anaemia	39w5d	nvd	N	no	no	no	f	3.1	8/10,9/10	no	n	0.38
273	mrs.n	21	primi	yes	no	no	38w4d	emer lscs	N	no	no	no	m	2.8	7/10,8/10	no	hypo	0.28
274	mrs.k	29	g3p1l1a1	no	yes	hypothyroid	38w3d	nvd	N	no	no	no	m	3.5	7/10,8/10	no	hypo	0.26
275	mrs.m	27	g2p1l1	no	no	no	35w4d	nvd	N	no	no	no	m	2.3	7/10,8/10	no	n	0.39
276	mrs.t	30	primi	no	no	no	39w2d	emer lscs	N	no	no	no	m	2.9	7/10,8/10	no	n	0.4
277	mrs.p	19	primi	no	no	no	40w2d	emer lscs	N	no	no	no	f	3.1	7/10,9/10	no	n	0.4
278	mrs.a	23	g3p2l1	no	no	no	40w4d	nvd	N	no	no	no	f	2.9	7/10,8/10	no	n	0.4
279	mrs.l	25	g3p1l1a1	no	no	no	39w4d	nvd	N	no	no	no	m	2.8	8/10,9/10	no	n	0.4
280	mrs.g	22	primi	no	no	no	38w3d	nvd	N	no	no	no	m	2.7	8/10,9/10	no	n	0.38
281	mrs.m	21	primi	no	no	no	38w2d	emer lscs	AbN	no	no	no	f	2.9	7/10,8/10	no	n	0.36
282	mrs.m	23	primi	yes	no	anaemia	39w3d	nvd	N	yes	no	no	f	3.2	5/10,8/10	yes	hyper	0.58
283	mrs.e	25	g2p1l1	no	no	no	38w4d	nvd	N	no	no	no	f	2.9	7/10,8/10	no	n	0.39
284	mrs.t	24	g2a1	no	no	no	40w2d	emer lscs	N	no	no	no	m	2.7	7/10,8/10	no	n	0.4

285	mrs.p	22	primi	no	no	no	40w1d	emer lscs	N	no	no	no	m	3.2	8/10,9/10	no	n	0.38
286	mrs.d	18	primi	no	no	anaemia	38w1d	emer lscs	N	yes	no	no	f	2.8	7/10,8/10	no	n	0.37
287	mrs.k	29	g3p1l1a1	no	no	no	39w5d	nvd	N	no	no	no	f	2.9	7/10,9/10	no	n	0.39
288	mrs.m	27	g2p1l1	no	no	no	38w2d	nvd	N	no	no	no	m	2.6	7/10,8/10	no	n	0.38
289	mrs.g	25	primi	no	no	no	39w1d	nvd	N	no	no	no	m	3.5	8/10,9/10	no	n	0.39
290	mrs.a	26	g3p1l1a1	no	no	no	38w4d	nvd	N	no	no	no	f	2.9	7/10,8/10	no	hyper	0.59

s.no	name	age	obst.score	pih	gdm	medi dis	ga at delivery	mode of delivery	ctg	msl	abrup	iud	sex	b wt	apgar	nicu	uci	an uci
291	mrs.r	30	g3p2l1	no	yes	anaemia	36w4d	nvd	N	no	no	no	m	3	7/10/8/10	yes	hypo	0.32
292	mrs.g	33	g2p1l1	no	yes	no	38w1d	emer lscs	AbN	no	no	no	m	3.2	7/10,8/10	no	hypo	0.24
293	mrs.s	21	primi	no	no	no	39w6d	emer lscs	N	no	no	no	f	2.9	8/10,9/10	no	n	0.39
294	mrs.o	22	primi	no	no	no	38w2d	emer lscs	N	no	no	no	f	2.7	7/10,8/10	no	n	0.4
295	mrs.l	31	primi	no	no	no	39w4d	emer lscs	N	yes	no	no	f	2.1	6/10,7/10	yes	hyper	0.56
296	mrs.a	28	g3p1l1a1	no	yes	no	38w2d	nvd	N	no	no	no	m	3.9	7/10,8/10	no	n	0.4
297	mrs.r	29	g2p1l1	no	no	epileptic	39w2d	nvd	N	no	no	no	m	3.4	8/10,9/10	no	n	0.4
298	mrs.t	27	primi	no	no	no	39w1d	nvd	N	no	no	no	f	3.1	8/10,9/10	no	n	0.4
299	mrs.h	23	primi	no	no	no	40w4d	emer lscs	AbN	no	no	no	f	2.7	6/10,7/10	yes	n	0.4
300	mrs.g	22	primi	no	no	no	38w2d	nvd	N	no	no	no	m	2.7	8/10,9/10	no	n	0.38

KEY TO MASTER CHART

Msl – meconium stained liquor

Ctg – Cardiotocograph

Medi dis – Medical disorders

Abrup – Abruption

GA – Gestational Age

IUD – Intra Uterine Death

UCI – Umbilical Coiling Index

AN UCI – Antenatal Umbilical Coiling Index

N – Normal

AbN – Abnormal

NVD – Normal Vaginal Delivery

Emer LSCS – Emergency Lower Segment Caesarean Section

F – Female

M – Male

n – Normocoiled

ABBREVIATIONS

UCI – UMBILICAL CORD COILING INDEX

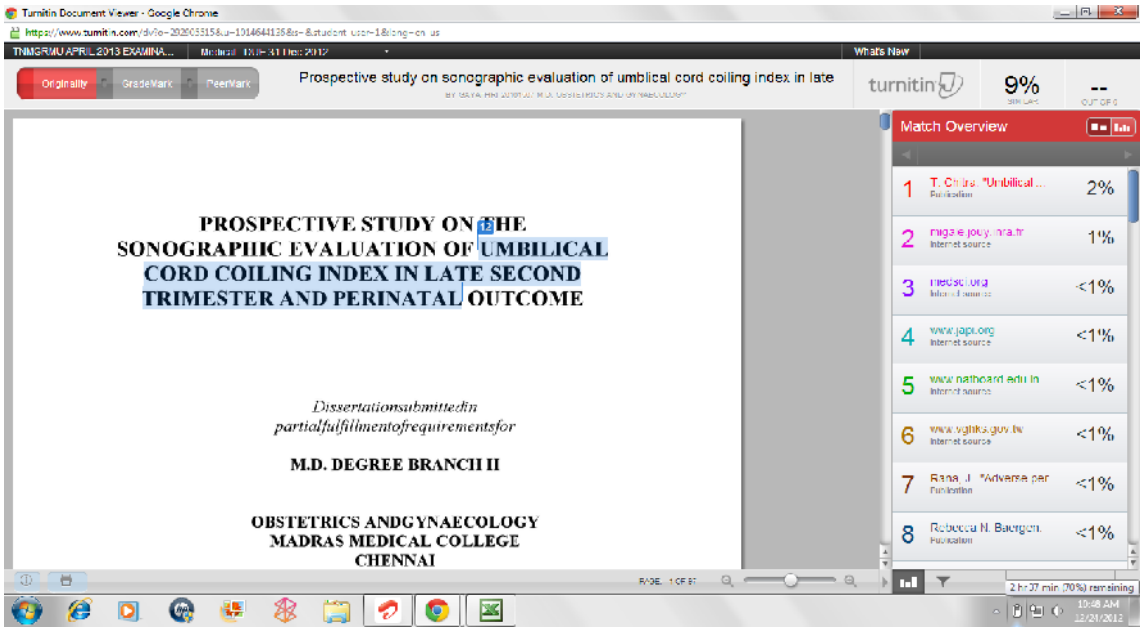
GDM – GESTATIONAL DIABETES MELLITUS

CTG - CARDIOTOCOGRAPH

NICU – NEONATAL INTENSIVE CARE UNIT

LSCS – LOWER SEGMENT CAESEREAN SECTION

CPD – CEPHALO PELVIC DISPROPORTION


Turnitin Document Viewer - Google Chrome
TNMGRMU APRIL 2013 EXAMINA...
Originality
GradeMark
PeerMark
Prospective study on sonographic evaluation of umblical cord coiling index in late
What's New
turnitin
9%
Match Overview
1 T. Chitra, "Umbilical... 2%
2 1%
3 <1%
4 www.japi.org <1%
5 www.nathboard.edu.in <1%
6 www.vghks.gov.tw <1%
7 Rana, J. "Adverse per <1%
8 Rebecca N. Baergen, <1%
PROSPECTIVE STUDY ON THE
SONOGRAPHIC EVALUATION OF UMBILICAL
CORD COILING INDEX IN LATE SECOND
TRIMESTER AND PERINATAL OUTCOME
Dissertationsubmittedin
partialfulfilmentofrequirementsfor
M.D. DEGREE BRANCH II
OBSTETRICS ANDGYNAECOLOGY
MADRAS MEDICAL COLLEGE
CHENNAI
PAGE: 1 OF 87
2 hr 37 min (70%) remaining
10:48 AM
12/21/2012